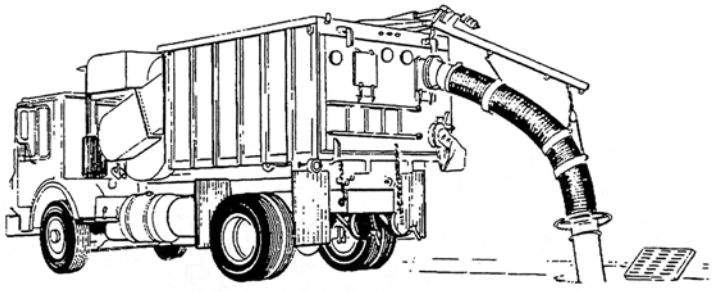
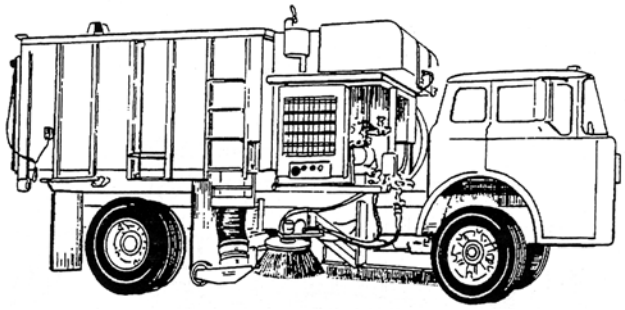
VAC/ALL®

vacuum equipment

E5/E10
service manual





Clean Earth
300 Fleming Road
Birmingham, AL 35217
205-841-7718 • FAX 205-841-8571

Part No. 105540

TO ORDER PARTS

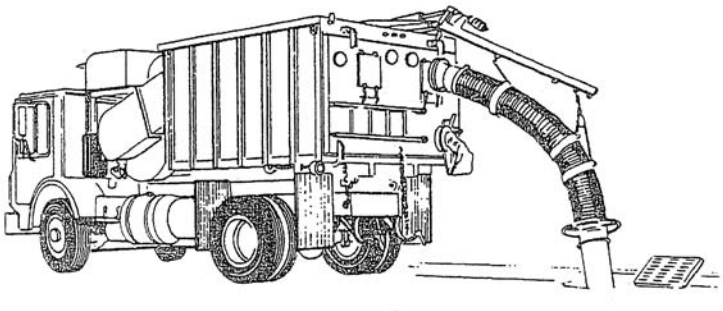
Contact your local authorized CEEG Signature original factory parts distributor

Your Authorized Vac/All Distributor

Provide the following information:

- A Company name
- B Date
- C Your order number
- D Routing instructions
- E Quantity, part number and description (See Vac/All Parts Manual)
- F Model and serial number of unit

Accept only Vac/All Signature original factory replacement parts.



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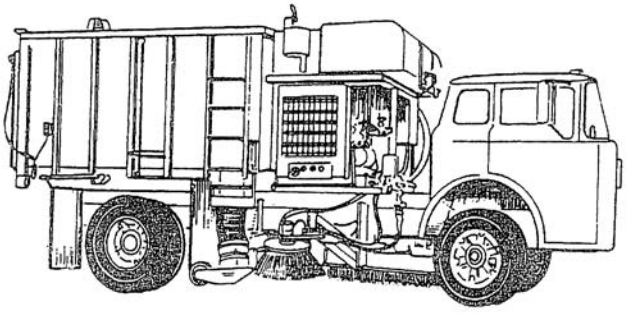

E10

VAC/ALL

BY

CLEAN EARTH ENVIRONMENTAL GROUP, LLC

LIMITED WARRANTY

New parts, components and assemblies manufactured by Clean Earth Environmental Group, LLC, (CEEG) are supplied and sold under a Limited Warranty that they are and will remain free from defects in workmanship or material for a period of one (1) year for the blower wheel and six (6) months for all other components from date of sale under reasonable conditions of use and operations, and if a failure occurs during said period because of such defect, in the opinion of CEEG, then CEEG shall, upon its return to CEEG at its Birmingham, Alabama plant, transportation prepaid, replace the defective part, component or assembly without charge, F.O.B., Birmingham, Alabama. Major components produced by other manufacturers are warranted as provided by the original manufacturers warranty.

CEEG makes no warranty of merchantability, fitness for use, legality of operation in any jurisdiction or any implied warranty of any kind or nature. CEEG shall not be liable for any special or consequential damages of any kind or nature, other that its limited warranty or replacement herein. No other person, firm or corporation can bind the company to any warranty other than hereinabove stated.

Because CEEG products are engineered to work only with genuine CEEG parts, this limited warranty will be void and of no effect if: (a) CEEG products are modified other than as done at its factory or as authorized to be done by the factory in writing; or (b) Parts or assemblies of any other manufacturer are used as substitutes for genuine CEEG parts.

There is no warranty on used parts.

This warranty excludes expendable parts such as, but not limited to, intake hoses, gaskets, seals, brushes, tube extensions or clamps.

Clean Earth reserves the right to redesign and/or discontinue the manufacture of parts, components, and assemblies at any time.

FOREWARD

CEEG Vac/All is a quality built product of the most advanced design in vacuum and street cleaning equipment. We at CEEG are proud of the quality materials and workmanship that go into each unit.

This manual was prepared for your use with the intention of providing clear, concise and easy to use operating instructions. We hope to have accomplished this goal.

Of growing concern to Clean Earth is the use of counterfeit, will-fit or substitute parts. The use of non-standard parts may affect the operation and performance, as well as void the warranty. Ensure maximum reliability and protect your investment — insist on CEEG Signature original factory parts.

One area of utmost importance to us here at CEEG is your safety. We suggest you read this manual from front cover to back cover carefully. Then, go back and read again the Safety Precautions in Section 2. They are important.

Lastly, we ask that if you have any comments or suggestions about this manual, let us hear from you. We are here to be of service to you — our customers.

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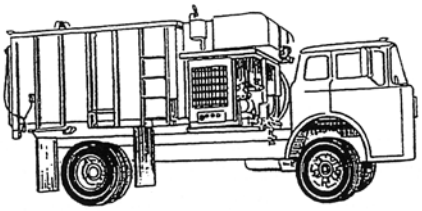
SECTION 1 GENERAL REPAIR PRACTICES

INTRODUCTION



This service manual is intended to be used in conjunction with the appropriate operators manual for the unit to be repaired. Before attempting any type of service, read and become thoroughly familiar with the operators manual for your specific unit.

⚠WARNING

Read and follow the safety precautions as outlined in this section as well as the safety precautions in the appropriate operators manual for the unit being repaired. Ensure that the operation and repair of the unit is in accordance with all applicable codes including the Occupational Safety and Health Act (OSHA) and the American National Standards Institute (ANSI) regulations.

⚠DANGER

⚠WARNING

⚠CAUTION

DANGER, WARNING, CAUTION and **NOTE** notations appear throughout this manual.

* The word **DANGER** precedes information pertaining to specific immediate hazards that if disregarded, WILL result in **SEVERE PERSONAL** injury or death of the user or others.
* The word **WARNING** precedes information pertaining to hazards or unsafe practices that COULD result in personal injury or death.
* The word **CAUTION** precedes information pertaining to potential hazards or unsafe practices that if disregarded may result in minor personal injury or damage to the equipment.
* The word **NOTE** precedes information that is vital to the proper operation or maintenance of the equipment.

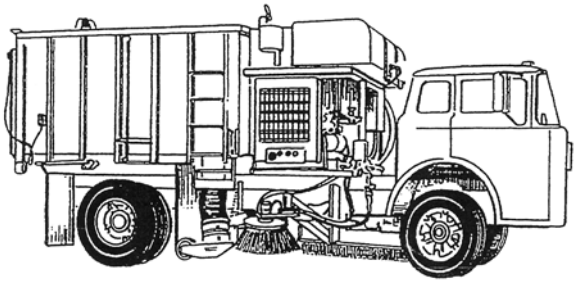
SECTION 1 GENERAL REPAIR PRACTICES

Proper service and repair is important for the safe, reliable operation of all mechanical products. The service procedures recommended and described in this service manual are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. These special tools should be used when and as recommended.

It is important to note that deviating from these procedures could cause damage to the unit or render it unsafe. However, please remember that these procedures are not all inclusive. Since Clean Earth could not possibly know, evaluate, and advise the service trade of all possible ways in which service might be done or of the possible hazardous consequences of each way, we have not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool that is not recommended by Clean Earth must first thoroughly satisfy himself that neither his nor the operator's safety will be jeopardized by the service methods selected.

PREPARATION FOR SERVICE

Proper preparation is very important for efficient and safe service work. A clean work area at the start of each job will allow you to perform the repair as easily and quickly as possible and reduce the incidence of misplaced tools and parts. If the portion of the unit to be repaired is excessively dirty, it should be cleaned before work starts. Cleaning will occassionally uncover trouble sources. Tools, instruments and parts needed for the job should be gathered before work is started. Interrupting a job to locate tools or parts is a needless delay.



REPLACEMENT PARTS

Of growing concern to Clean Earth is the use of counterfeit, will-fit, or substitute parts. The use of non-standard parts may affect the operation and performance and will void the warranty. Ensure maximum reliability and protect your investment — INSIST on original factory replacement parts.

SERVICE BULLETINS

In addition to the information given in this Service Manual, Service Bulletins are issued from time to time, which cover iterim engineering changes and supplementary information. Service Bulletins should be consulted for complete information on the Vac/All covered by this manual. (Check with your local distributor.)

SECTION 1 GENERAL REPAIR PRACTICES

SAFETY PRECAUTIONS

PRIOR TO PERFORMING ANY SERVICE OR REPAIR:

1. Set the parking brake.
2. Put the vehicle in park, or if manual transmission, put in gear and remove the ignition key.
3. Place an OSHA approved chock block in front and behind the front tire.
4. Whenever dismantling any hydraulic line, valve, or cylinder, be sure to turn off the hydraulic fluid flow, relieve the pressure, and slowly crack or loosen the fittings.

SAFETY DURING SERVICE AND REPAIR

1. Always wear safety glasses.
2. Disengage the clutch, turn off the ignition and remove the keys on the auxiliary engine before:
   a. entering the body;
   b. examining the clutch, pump, drive shafts, blower, sweeping apparatus, or body hoist;
   c. inspecting silencer;
3. Do not enter the area beneath the tailgate, when the tailgate is raised for maintenance or repair, unless the tailgate prop has been secured in the locked-down position.

WELDING PRECAUTIONS

ELECTRIC WELDERS

1. Electric arc welders should have a separate, fused disconnect circuit.
2. Welders must be used according to the manufacturer's specifications.
3. All electric welding should be done in a well-ventilated stall.
4. The radiation given off by the arc will destroy the retina or the eye; so wear an approved welder's helmet or goggles.
5. Welding radiation will produce sever burns on unprotected skin, similar to sunburn, so wear heavy clothing. Use natural fiber or leather — avoid synthetic fiber clothing.

OXY-ACETYLENE TORCHES

1. Acetylene is a highly explosive gas which should be treated with the greatest care. At pressures above 15 psi, acetylene will explode by decomposition without the presence of air. No other industrial gas has such a wide explosive range.
2. Oxygen will spontaneously ignite in the presence of oil and grease. The hose, torch handles, and the regulators must be kept free of petroleum products.
3. Before using the equipment, inspect it for cleanliness and for leaks.
4. Hoses cannot be safely repaired: when they show signs of deterioration, they should be replaced.
5. Return regulators periodically to the distributor for inspection. Store gas bottles upright and out of the sun. Do not attempt to repair or make internal adjustments on the regulators yourself.
6. If you suspect a leak in the system, make a bubble test with Ivory soap. DO NOT USE ANY OTHER BRAND OF SOAP BECAUSE OF THE DANGER OF OXYGEN COMBINING WITH IT AND EXPLODING.
7. When repairing to use the torch, make certain that the regulator valves are all the way out to the "off" position before the main tank valves are opened to protect the regulators from the sudden impact of tank pressure.
8. When opening the tank valves, stand alongside of the regulators, out of the way, in case they blow out.
9. Backfiring or "machine gunning" at the torch is very dangerous and can lead to a major explosion.
10. Welding should be done in a location well away from flammable materials.

REMOVAL, DISASSEMBLY AND REPAIR

1. Cleanliness is very important; dirt is the number one cause of wear on bearings, bushings and especially on hydraulic components.
2. Inspect hydraulic components for leaks before cleaning. The dirt build up on the component can aid in tracing fluid leaks.
3. Clean hydraulic connections before removal to prevent dirt from entering component.
4. Loosen hydraulic fittings slowly to release pressure.
5. Cap hydraulic fittings immediately after removal to prevent dirt from entering component or line and to prevent fluid from leaking.
6. Clean component in non-flammable solvent before disassembly.
7. Inspect component after cleaning for signs of wear or external damage.
8. When disassembling a component, note the position of each part as it is removed to aid in reassembly.
9. During disassembly note the condition of each part as it is removed to aid in diagnosing problems and to help prevent them in the future.
10. Clean and inspect disassembled parts for wear, cracks, dirt, etc.
11. After cleaning and inspection, re-usable hydraulic parts should be immediately coated with clean, fresh hydraulic fluid to prevent rust formation. If these parts are not going to be reinstalled immediately, they should be wrapped in a clean, lint-free cloth or paper to prevent nicks or scratches.
12. When repacking a cylinder or resealing a valve, replace all seals and o-rings that are disturbed during the repair. The price of a few seals is very little compared to a return-repair job.

REMOVAL AND INSTALLATION:

1. Assemble parts in same position as removed.
2. Align parts accurately before mating.
3. Inspect o-ring and seal groove for sharp edges, nicks or burrs before installing new sealing parts.
4. Lubricate all new sealing parts with clean, fresh hydraulic fluid before installation.
5. Use care not to damage new sealing parts on reassembly.
6. Use correct torque values when reassembling and installing components. See CAPSCREW MARKING AND TORQUE VALUES.
7. Always check hydraulic fluid level in the hydraulic fluid tank after performing any service or repair of the hydraulic system.
8. Always lubricate components with grease fittings after they have been repaired and reinstalled.
9. Use only Clean Earth signature original factory parts.

WELDING

1. When rewelding an old weld, be sure the old weld is completely cleaned out.
2. When repairing a cracked weld, the old weld should be completely removed before rewelding.
3. When adding a part or attachment, be sure: the metal is clean before welding, the part is properly located and the weld will not cause damage to adjacent parts.

ELECTRICAL TESTING

The electrical system used on the Vac/All consists of various lights, switches and wiring. Testing the components and wiring can be accomplished by two simple checks: CHECKING FOR CURRENT and CHECKING CONTINUITY.

CHECKING FOR CURRENT

A 12-volt test light is used to check for the presence of electricity in a live circuit. Connect the test light clip to a good ground and the probe at the point where the presence of current is to be checked. If current is present, the light will be on. If no current is present, the light will be off.

CHECKING CONTINUITY

A continuity tester is used to check the ability of a conductor to allow current to pass through it. A continuity tester uses a self-contained power source, and should never be used on a live circuit. Connect the clip to one side of the component to be tested and touch the probe to the other side. If the component has the potential to pass current, has continuity, the light will be turned on. If the component is not able to pass current, there is no continuity and the light will be off.

SECTION 2 SPECIFICATIONS

LUBRICANTS

Oil . . . . . .SAE #10 or equivalent
Grease . . . . . .Multiservice (quantity grade)
(High temperture lithium base blower bearings & throw out collar only)

HYDRAULIC SYSTEM

Capacity (approximately):

Fluid tank . . . . . .20 gal. tank
System pressure setting . . . . . .2500 PSI
Type of fittings . . . . . .Steel tubing with brazed and flared fittings:
reinforced rubber hose with crimped
full-flow fittings, o-ring fittings
Filtration . . . . . .Sweeper only - Pressure line disposable filter element

PUMP

Type . . . . . .Positive displacement; gear type
driven by auxiliary engine
Capacity . . . . . .(Dual Section-Sweepers Only)
11.0 gpm @ 2200 rpm
7.0 gpm @ 2200 rpm

CEEG HYDRAULIC FLUID RECOMMENDATION

All Vac/All hydraulic systems are factory filled with a high quality anti-wear hydraulic fluid meeting an ISO 32 specification. On units put into service where there are high ambient temperature or sustained high duty cycles, it may be desirable to change the fluid to an ISO 46 specification (higher viscosity). In colder climates or light duty, an ISO 22 might be more appropriate. The International Standards Organization assigns specification numbers so that a consumer receives the same product from various suppliers.

GRADE ISO/VISCOSITY	22	32	46
AGMA NO			1
Gravity, API	33	31	31
Flash, ºF	375	380	390
Pour Point, ºF	-20	-20	-20
Viscosity:			
SSU @ 100º F	112	158	228
SSU @ 210º F	40	44	48
cSt @ 40º C	21	30.5	44
cSt @ 100º C	4.1	5.2	6.5
Viscosity Index	98	99	99
ASTM Oxidation Test (Hours to 2.0 Neut. No.)	2500	2500	2500
ASTM Rust Test, A & B	Pass	Pass	Pass
Foam Test	Pass	Pass	Pass
Vickers Vane Pump Test	Pass	Pass	Pass
Dielectric Strength (ASTM 877) EC # @ 180º F	25Kv	25Kv	25Kv
	40-37-3(10)	40-37-3(15)	40-37-3-(15)

⚠CAUTION

Do not use engine oil, automatic transmission fluid (ATF), or add diesel or kerosene to the hydraulic fluid. The service life of all hydraulic system components may be adversely affected.

HYDRAULIC FLUID

To serve its purpose and give long and satisfactory service, hydraulic fluid must possess desirable physical and chemical characteristics. Stability over a wide range of temperatures and under agitation is very important.

Premium hydraulic fluids should be used in Vac/All hydraulic systems. In addition to the above characteristics, selected additives should be added to provide additional resistance to wear, corrosion, oxidation, decomposition and foaming. All additive blending should be done by the lubricant supplier so that they are compatible with each other.

A reputable lubricant supplier backed up by a reputable oil company is great assurance of obtaining high quality products, and generally speaking, higher quality is worth higher initial cost.

CAPSCREW MARKING AND TORQUE VALUES

Usage	Much Used	Much Used	Used at Times	Used at Times
Capscrew Diameter & Minimum Tensile Strength PSI	To 1/2 - 69,000 To 3/4 - 64,000 To 1 - 55,000	To 3/4 - 120,000 To 1 - 115,000	To 5/8 - 140,000 To 3/4 - 133,000	150,000
Quality of Mat'l	Indeterminate	Min. Commercial	Med. Commercial	Best Commercial
SAE Grade Number CAPSCREW HEAD MARKINGS Manufacturer's marks may vary. These are all SAE Grade 5 (3-line).	1 or 2	5	6 or 7	8
Capscrew Body Size (Inches) - (Thread)	**Torque Ft-Lb (kg m)**	**Torque Ft-Lb (kg m)**	**Torque Ft-Lb (kg m)**	**Torque Ft-Lb (kg m)**
1/4 - 20	5 (0.69)	8 (1.11)	10 (1.38)	12 (1.66)
- 28	(0.83)	10 (1.38)		14 (1.94)
5/16 - 18	11 (1.52)	17 (2.35)	19 (2.63)	24 (3.32)
- 24	13 (1.80)	19 (2.63)		27 (3.73)
3/8 - 16	18 (2.49)	31 (4.29)	34 (4.70)	44 (6.09)
- 24	20 (2.77)	35 (4.84)		49 (6.78)
7/16 - 14	28 (3.81)	49 (6.78)	55 (7.61)	70 (9.68)
- 20	30 (4.15)	55 (7.61)		78 (10.79)
1/2 - 13	39 (5.39	75 (10.37)	85 (11.76)	105 (14.52)
- 20	41 (5.67)	85 (11.76)		120 (16.60)
9/16 - 12	51 (7.05)	110 (15.21)	120 (16.60)	155 (21.44)
- 18	55 (7.60)	120 (16.60)		170 (23.51)
5/8 - 11	83 (11.48)	150 (20.75)	167 (23.10)	210 (29.04)
- 18	95 (13.14)	170 (23.51)		240 (33.19)
3/4 - 10	105 (14.52)	270 (37.34)	280 (38.72)	375 (51.86)
-16	115 (15.90)	295 (40.80)		420 (58.09)
7/8 - 9	160 (22.13)	395 (54.63)	440 (60.85)	605 (83.67)
-14	175 (24.20)	435 (60.16)		675 (93.35)
1 - 8	235 (32.50)	590 (81.60)	660 (91.28)	910 (125.85)
- 14	250 (34.58)	660 (91.28)		990 (136.92)

NOTES:
1. Always use the torque values listed above when specific torque values are not available.
2. The above is based on use of clean, dry threads.
3. Reduce torque by 10% when engine oil is used as a lubricant.
4. Reduce torque by 20% if new plated capscrews are used.
5. General Formula for calculating Torques is as follows: Torque in Inch Lbs. = .2 x Nominal Diameter of Screw x Loads in Ls., where Load = 80% of Yield Strength, expressed in Lbs., not pounds per square inch.

WELDING

1. When rewelding an old weld, be sure the old weld is completely cleaned out.
2. When repairing a cracked weld, the old weld should be completely removed before rewelding.
3. When adding a part or attachment, be sure: the metal is clean before welding, the part is properly located and the weld will not cause damage to adjacent parts.
4. Use the following rods (rod-AWS number) for welding:
   - Body E6010, E6011, E6013
   - Power boom, Hoist E1118, E7018
   - Tailgate, Blower housing E6010, E6011, E6013
5. When using a wire welder use ER70S-6 or ER70S-3 for all locations.

LIFTING INSTRUCTIONS

Because of the size and weight of some of the major components found on the unit, it is necessary to use suitable lifting devices for removal. The following components require lifting devices for removal:

CAPACITY OF LIFTING DEVICE REQUIRED FOR REMOVAL BODY

Cylinders . . . . . .500 lbs.
Blower wheel . . . . . .500 lbs.
Body hoist . . . . . .2000 lbs.
Boom assembly . . . . . .1500 lbs.
Intake hose . . . . . .1000 lbs.
Tailgate . . . . . .1500 lbs.
Body . . . . . .6000 lbs.
Water Tank Steel . . . . . .1000 lbs.
Water Tank Poly . . . . . .300 lbs.

Nylon sling straps should be used for the removal of cylinders. The following specifications should be used to determine type of sling straps to use for lifting.

SLING STRAP SPECIFICATIONS

Type USS-26-EN1
Rating
- Vertical lift . . . . . .4800 lbs.
- Choker lift . . . . . .3600 lbs.
- Basket lift . . . . . .9600 lbs.

Width . . . . . .2 in.
Length . . . . . .depends on type of lifting device used

Chains should be used to lift and/or support the body, hoist, power frame and tailgate. The following specifications should be used to determine the type of chain and hardware to use for lifting.

CHAIN AND HARDWARE SPECIFICATIONS

Chain
- Type . . . . . .D.O.F. (Double Branch, Oblong Link, Foundry Hook)
- Size . . . . . .1/2 in.

Hammer locks . . . . . .1/2 in.
Oblong rings . . . . . .1/2 in.

SECTION 3 PREVENTATIVE MAINTENANCE

GENERAL

The Vac/All has been designed for long periods of efficient, uniterrupted operation. Careful attention to proper preventative maintenance as described in this section, will ensure and extend troube free operation of the unit. Particular attention to correct lubrication of the unit, routine cleaning, and maintenance of the hydraulic system are the most vital areas of preventative maintenance required. The objective of preventative maintenance is to anticipate and prevent operational difficulties before they require extended shut down for costly repairs.

OPERATING AND MAINTENANCE RECORDS

Prepare and adhere to a maintenance schedule. Keep detailed records of all maintenance performed. Regularly inspect operating and maintenance records for deviations from normal operating conditions. Analyze the record for indications of potential trouble.

NOTE

Occasionally distributors will receive service bulletins from Clean Earth concerning updated maintenance information. Keep those bulletins with this manual referencing the updated information.

PREVENTATIVE MAINTENANCE REQUIREMENTS

DAILY PREVENTATIVE MAINTENANCE

Each day perform the following maintenance:

⚠ DANGER

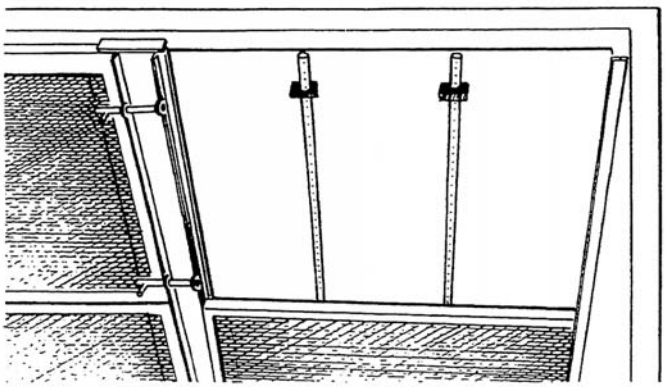
Never enter the Vac/All body until the blower is disengaged and the truck and auxiliary engines are off with the keys removed and placed in your pocket. Before entering the body, secure the tailgate prop in locked position.

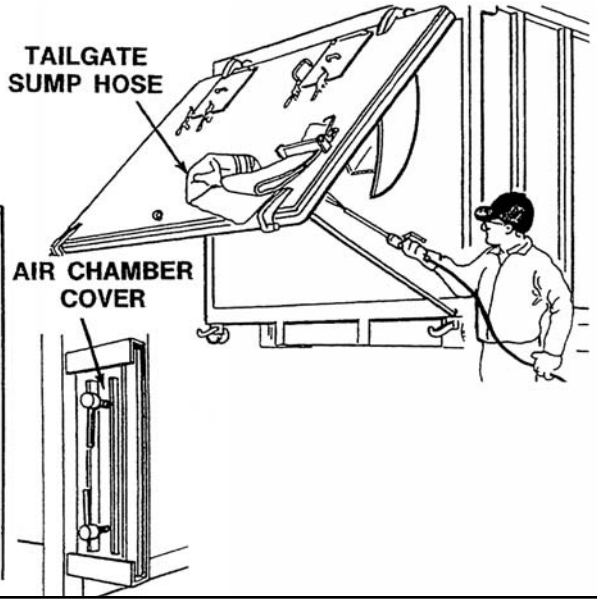
1. INSPECTION
   Perform the PRE-OPERATIONAL INSPECTION described in the Operators Manual.
2. DAILY CLEANING:
   A. Lower the hinged front baffle inside the body.
   B. Wash the inside front vacuum body including behind the front baffle and the filter screens.
   C. Remove both clean-out covers from the front air chamber, flush out any accumulated material. Replace covers.
   D. Drain water from hose on the tailgate sump.
   E. After the cleaning is completed, start the Vac/All engine, engage the blower fan, and run the unit for a short time. This will remove the moisture from the body, filter screens, and the front air chamber.

NOTE

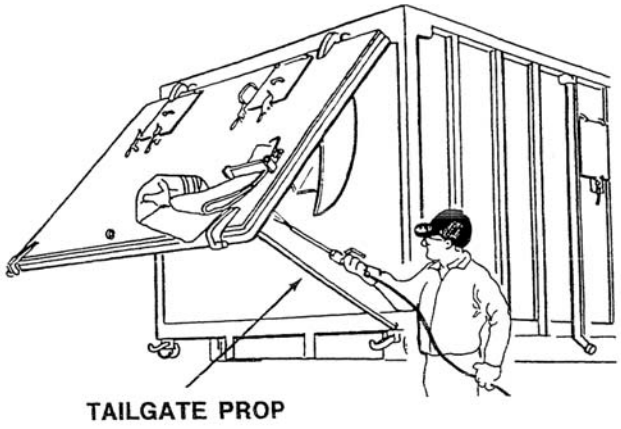
Drain auxiliary water tank when the ambient temperature is below 32º F (0º C).

   F. Next remove the air chamber clean-out covers, crack open the tailgate, and raise the body slightly when parking the unit overnight.

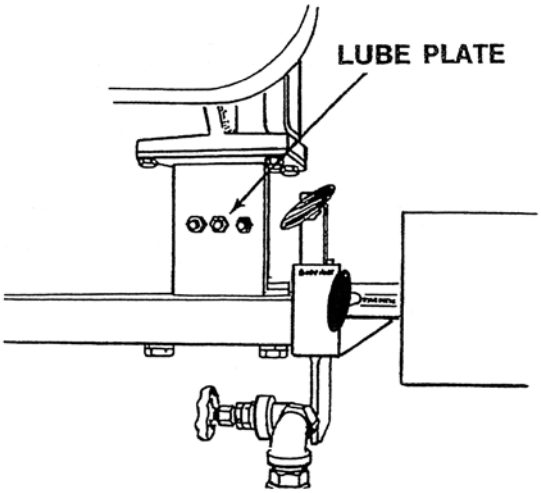




3. CLEANING THE BODY
   Clean and prime or paint exposed metal surfaces to prevent the formation of rust. This is particularly important on the inside walls, floor, and deflectors of the body.



4. BLOWER BEARING AND THROW OUT COLLAR LUBRICATION
   Refer to the lubrication chart later in this section for the location of the centralized lube plate located on the engine sub-frame of the Vac/All. A good water resistant, lithium based, high temperature grease should be used. Lubricate the bearings at the end of each work day or every 8 hours of continuous operation. Lubricate the bearings with the blower rotating slowly. This will eliminate air pockets that may lead to condensation and displace any moisture that may have accumulated.



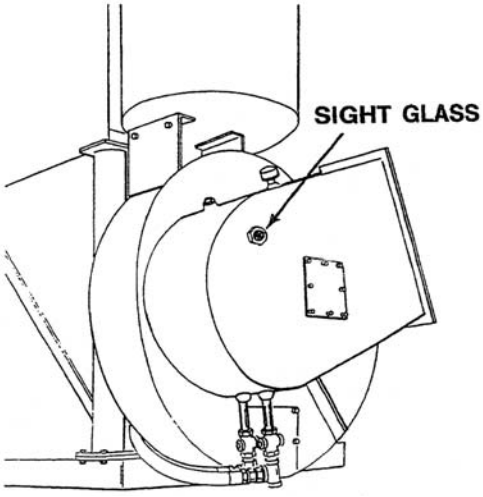
⚠CAUTION

Use only a hand held grease gun when lubricating blower bearings. Pneumatic type greasers have the potential of pushing the seals out of the bearings. Do not over grease.

5. CHECKING FLUID LEVEL (DAILY)
   When checking the fluid level in the hydraulic tank, ensure that all cylinders are in their retracted position. The fluid level sight glass should be half covered. If low, fill the hydraulic tank with hydraulic fluid as specified in SPECIFICATIONS section.

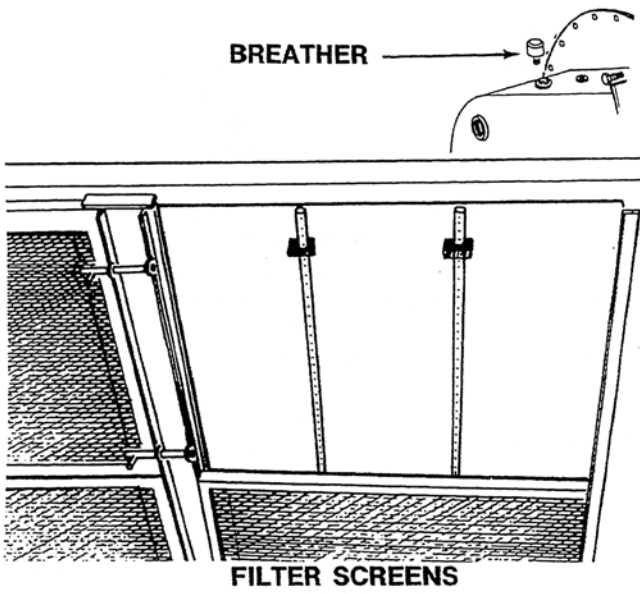
NOTE

When checking the fluid level, note any frequent or sudden loss of fluid. This could indicate leakage, which must be traced and corrected to avert equipment failure and possible damage to components.



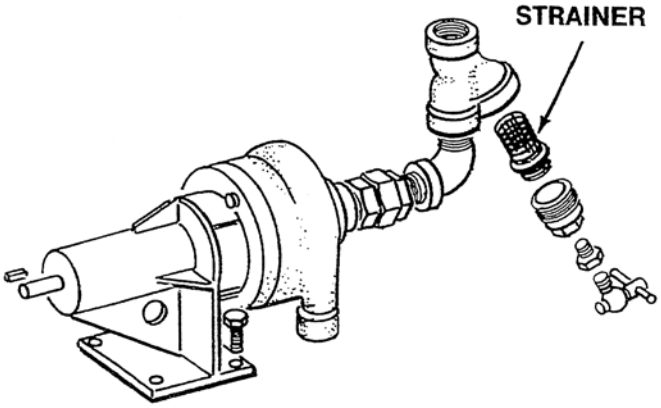
WEEKLY PREVENTATIVE MAINTENANCE

1. CLEAN TALK BREATHER
   Clean the air breather every week. Replace a breather that cannot be cleaned adequately.
2. CLEAN BODY FILTER SCREENS
   Each week completely remove the filter screens from the body and wash both sides of the perforated surfaces along with the screen tracks. To lower the screens from the body, remove the cotter pins in the latch arms, which support the screen in the center track. Move the latch arm out while supporting the screen, only far enough to remove one side of the screen. Lower the screen to the floor and continue the process until all screens are removed from one side of the body. Continue in the same manner on the opposite side of the body until all screens are removed. Replace in reverse order as previously described.



3. LUBRICATION
   Refer to the lubrication chart later in this section and service those items that require weekly lubrication.

4. WATER PUMP STRAINER
   Weekly, remove the in-line strainer located in the "Y" of the water pump feed; clean, and reinstall.



5. BODY HOIST
   a. Inspect capscrews at hinge shaft lock, at upper and lower trunnion ends of cylinder, at cylinder and lifting lever cross shafts, at frame, at valve and at pump.
   b. Inspect all hose lines for damage and hose ends for tightness.
   c. Check valves control for proper shifting.
   d. Inspect seals in control valves.
   e. Check cylinder packing (a light film of fluid on the piston rod is acceptable).

6. SILENCER INSPECTION

GENERAL SILENCER DESCRIPTION

The Silencer Assembly consists of an outer steel shell lined with acoustic foam retained by perforated metal. The silencer has been manufactured for maximum sound level reduction and for ease of maintenance. In order to maintain maximum effectiveness of the silencer, periodic inspection and cleaning is recommended. The frequency of cleaning will depend upon the number of hours of use and the amount of material ingested into the silencer.

CLEANING PROCEDURE

The acoustic foam must be removed from the silencer for cleaning. Remove the silencer cover and retaining nuts. Remove the screws from the seam of the internal perforated metal retainer and remove the retainers and foam. Remove the lower perforated retainer and foam.

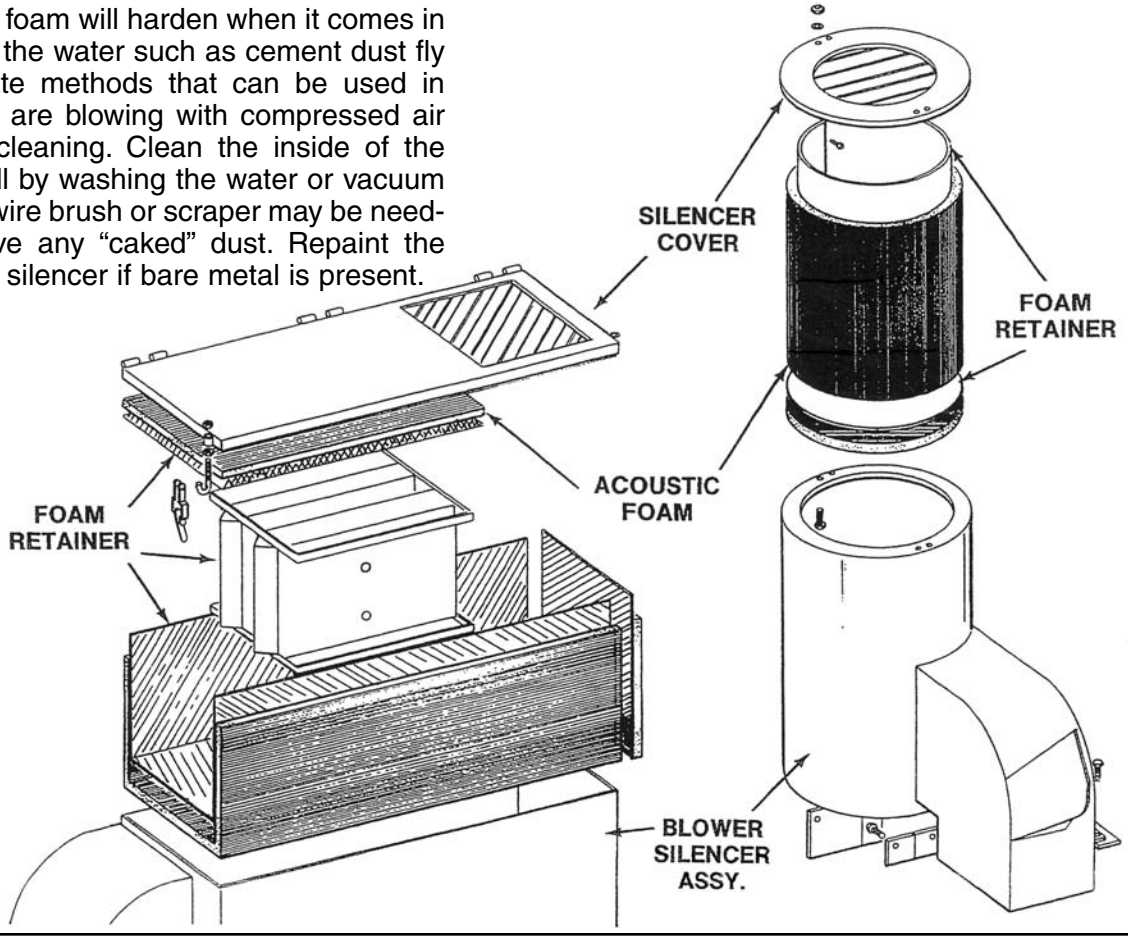
The cleaning method used to clean the foam will depend on the trapped material. A mild soapy water solution can normally be used for washing the acoustic foam unless the material plugging the foam will harden when it comes in contact with the water such as cement dust fly ash. Alternate methods that can be used in these cases are blowing with compressed air or vacuum cleaning. Clean the inside of the silencer shell by washing the water or vacuum cleaning. A wire brush or scraper may be needed to remove any “caked” dust. Repaint the inside of the silencer if bare metal is present.

SILENCER ASSEMBLY

Be sure the inside of the silencer is free from dirt and completely dry before reinstalling the acoustic foam. To install, reverse the removal procedure.

ACOUSTIC FOAM REPLACEMENT

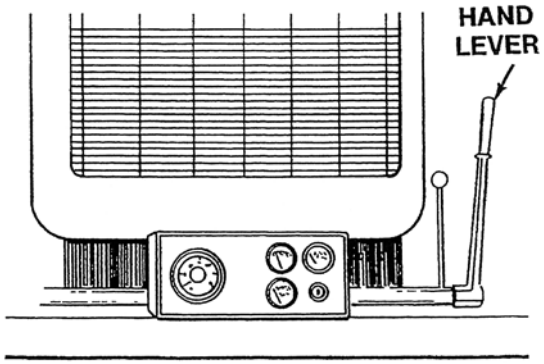
If the foam has become unserviceable through deterioration, it must be replaced. When ordering replacement acoustical foam and retainers, refer to the parts list to ensure correct parts.



7. CHECKING CLUTCH ADJUSTMENT

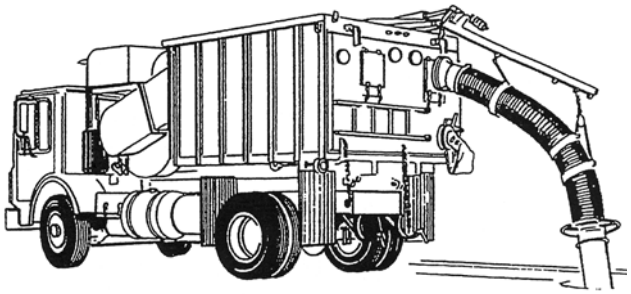
CLUTCH ADJUSTMENT
With the engine off, engage the clutch. The hand lever should require a distinct pressure and an audible snap should be heard when the clutch engages. If not, it should be adjusted per instructions in the Rockford instruction sheets.

NOTE
The clutch may require adjustment several times during the first months of operation.



8. CHECK AIR ACCESS AREAS

AIR INTAKES
Check all intake hoses, nozzles, and deflectors for wear. Also check for tight connections between intake couplers, nozzles, ball joints, etc. Air leaks will reduce the efficiency of the blower.

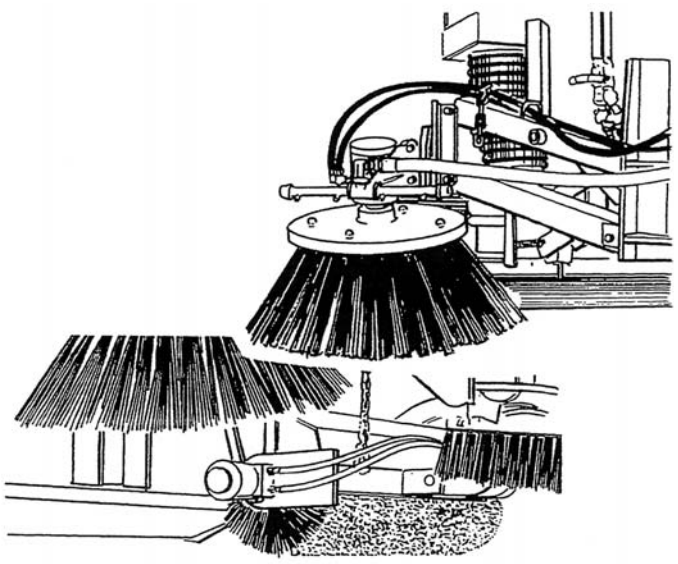


9. ELECTRICAL CHECKOUT

ELECTRICAL
Check electrical wiring and insultation for frays, breaks, and loose connections.

10. GUTTER BROOM INSPECTION
    View the condition of the gutter broom, if so equipped. Replace when the linkage will no longer allow sweeping pattern described.

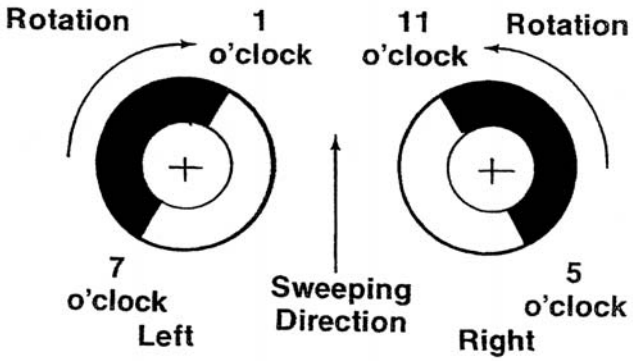
11. TRANSFER BROOM INSPECTION
    View the condition of the transfer broom, if so equipped. Replace when the broom has worn to the point that the “flicking” action of the broom is erased.

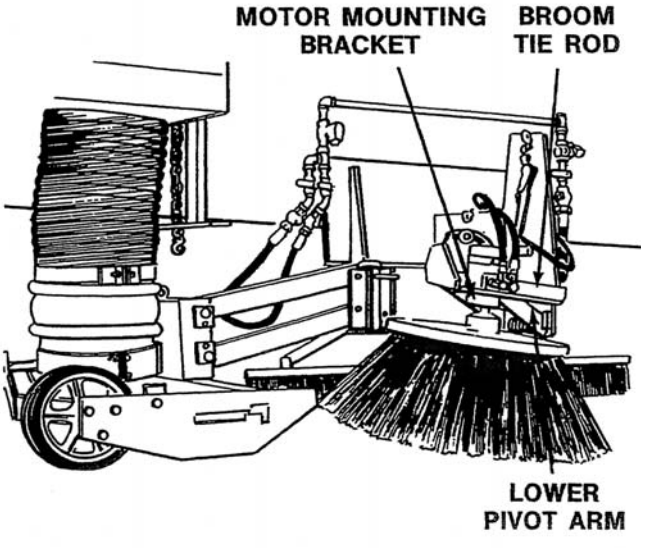


12. BROOM WEAR ADJUSTMENT
    The gutter broom can be adjusted for road contact and wear at two (2) places, the motor mounting bracket and the lower broom pivot arm. The correct contact area is illustrated below:

    Rotating the angle of the contact of the broom is done by rotating the motor mounting bracket. To do this, loosen the two (2) clamp bolts located in the motor mounting bracket. Swivel the broom to the correct angle and retighten the clamp bolts. Lateral movement of the broom, away from or towards the truck chassis is done by adjusting the lower broom pivot arm. The proper broom contact areas are counter clockwise from a 5 o’clock position to an 11 o’clock position for the right-hand broom and clockwise from 7 o’clock to 1 o’clock for left-hand broom.

    A supplementary adjustment is also provided in the broom tie rod. To change the length of the rod assembly, loosen the lock nuts located at the ends of the rod. Turn the tie rod in or out to required length. Retighten lock nuts. Lengthening the tie rod assembly will produce a wider swath when the broom is in contact with the road. This will also cause the broom to retract a shorter distance when raised. Shortening the tie rod assembly will result in a narrower swath, closer to the truck, when the broom is down. This will also cause the broom to retract a greater distance when it is raised.



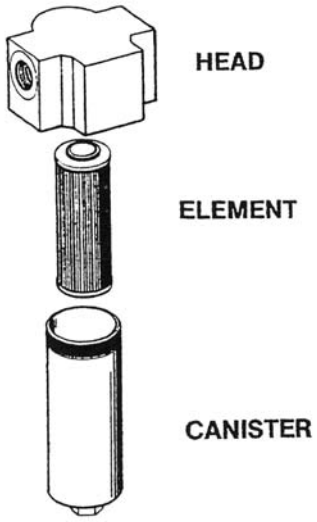


MONTHLY PREVENTATIVE MAINTENANCE

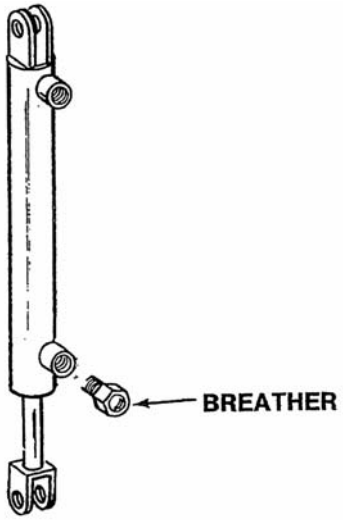
1. HYDRAULIC FILTER
   Once a month change the hydraulic filter(s), if your unit is so equipped.

   A. To removed the filter element, unscrew the filter canister from the filter assembly head and remove the filter element. Discard filter element, place a new element in the canister and secure the canister to the filter assembly head.

   NOTE
   Do not over tighten.



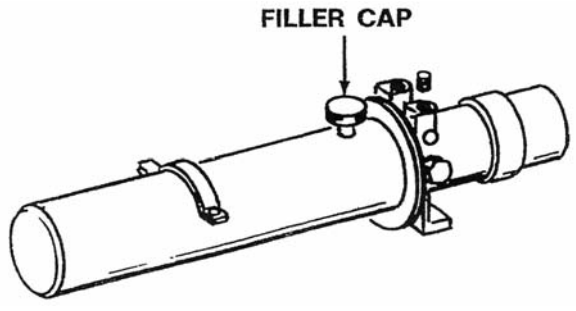
2. CYLINDER BREATHERS
   Each month check the air breather located on the boom lift cylinder, the gutter broom and nozzle lift cylinders and, if your unit is so equipped, on the transfer broom lift cylinder. If plugged, replace with a new breather.



3. POWER BOOM FLUID LEVEL
   Check hydraulic fluid level in the boom lift cylinder hydraulic circuit. The fluid level should be within one (1) inch of the filler cap.

   NOTE
   This electric-over hydraulic package is located on top of the debris body. If the unit is equipped with an engine-driven power boom, refer to the daily preventative maintenance schedule described earlier in this section.

   NOTE
   Cylinder must be in the fully retracted position.

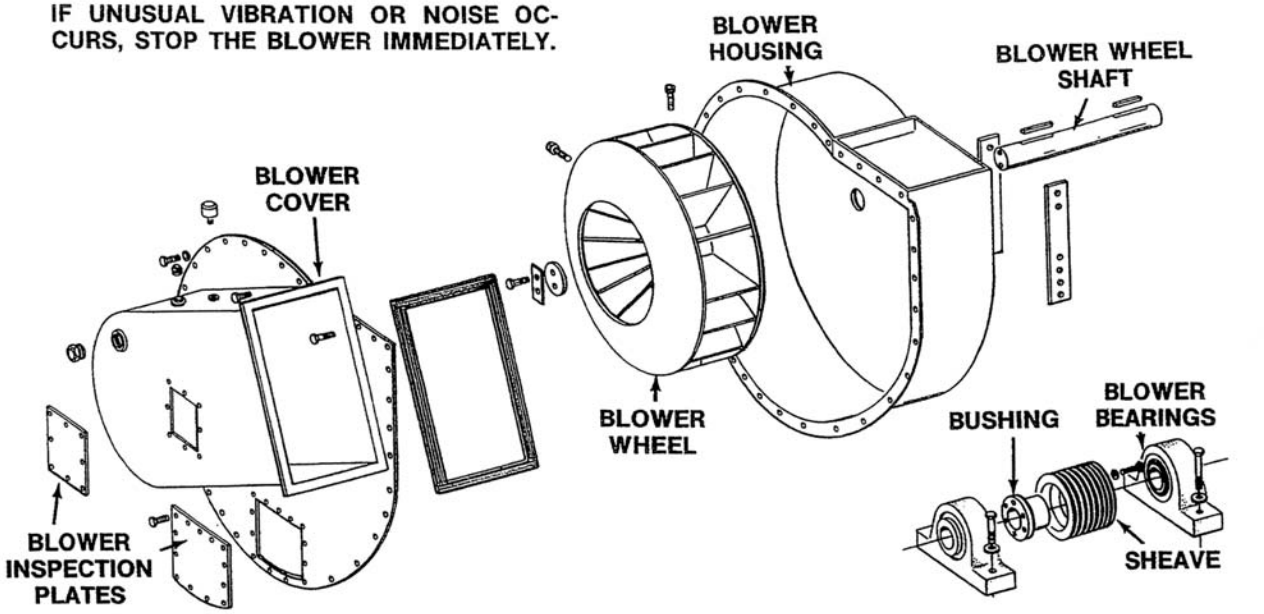


4. BLOWER

Blower inspection is essential for safe, dependable, and economical operation. The blower should be inspected monthly when used in normal service. More frequent inspection is necessary when the Vac/All is used in severe or abrasive conditions.

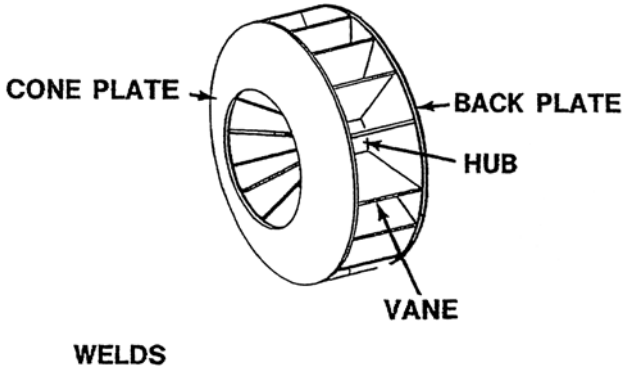
The blower requires little maintenance except lubrication of the blower bearings and inspection of the blower wheel. Periodic cleaning of the blower wheel will ensure good balance and increased bearing life.

IF UNUSUAL VIBRATION OR NOISE OCCURS, STOP THE BLOWER IMMEDIATELY.



INSPECTION PROCEDURE

A. Start the blower engine and raise the debris body. Secure the body with the body prop.
B. Shut down the blower engine, remove the key from the ignition switch, tag the steering wheel, and remove the battery cables.
C. Remove he blower wheel inspection plates located on the blower housing and intake duct.
D. Inspect the blower wheel and inside of the blower housing for possible build-up of foreign material. Steam clean when required.
E. Inspect the complete blower housing and wheel for possible cracks, wear, and corrosion. Inspect back plate, cone plate, hub, welds, and vanes. Inspection for cracks should be completed with the use of a visual aid such as Diecheck. Any cracks, however minute, will require a replacement blower wheel.



NOTE

If more than 3/16" of wear is evident on the vane, cone plate or back plate, the blower should be replaced.

F. Upon completion of the inspection, reinstall the blower inspection plates on the housing.
G. Reinstall blower engine battery cables.
H. Start the blower engine, lower the body props and lower the body.
I. Inspection of the dynamic balance condition of the blower wheel may be required. If vibration instrumentation is not available, a professional service should be employed to balance the blower assembly, which is accomplished by rotating the blower at full speed and measuring the vibrational displacement and frequency at the blower bearings. The recommended maximum vibrational displacement is 1.0 mils at approximately 50 cycles per second (CPS). Do not exceed 2.0 mils at 50 CPS. Re-balance the blower wheel when required.

⚠ DANGER

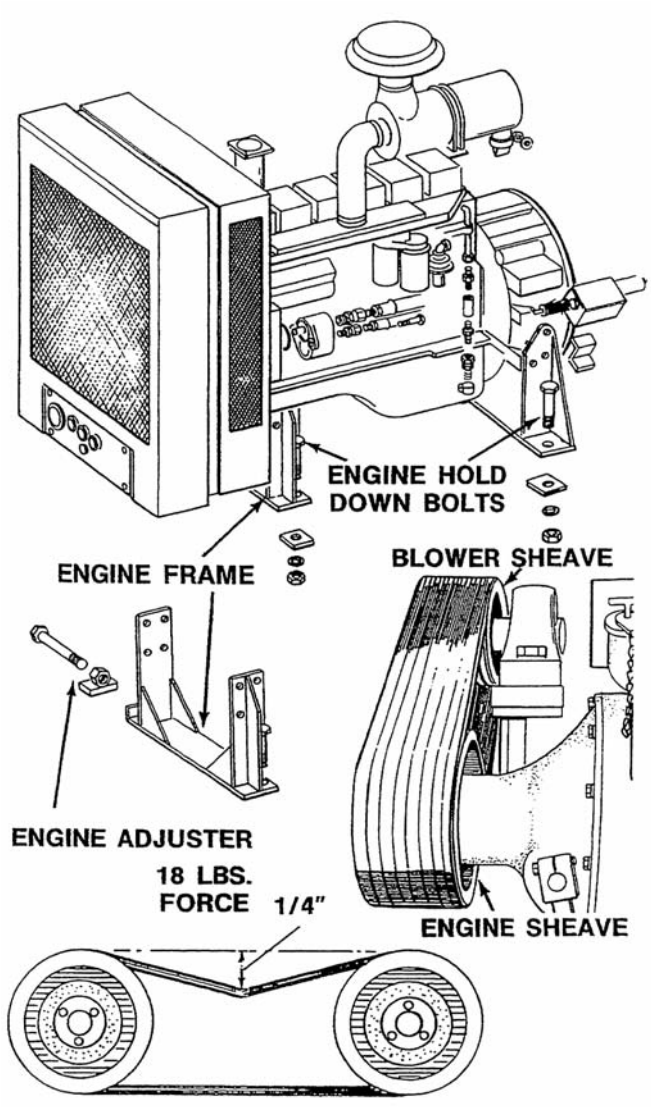
Never balance a unit that has the inspection covers removed from the blower housing.

5. CHECK BLOWER BELT ADJUSTMENT
Each month of operation the matched set of blower drive belts should be checked and adjusted as necessary. Proper belt tension is obtained when the belts are depressed in the center with each belt requiring 18 lbs. of force to deflect 1/4".

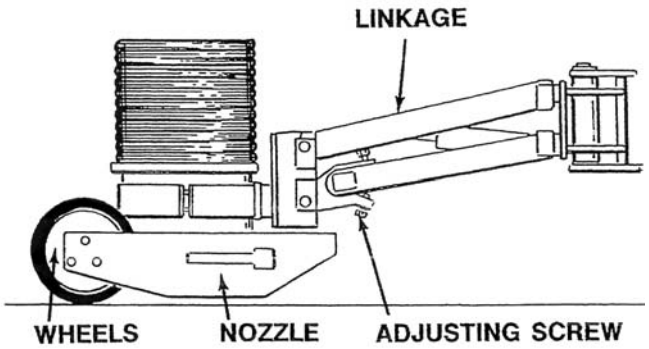
NOTE

A belt tension gauge 9877-0005 is available from Vac/All.

A. To adjust the tension, loosen the four (4) engine hold-down bolts at the engine frame just enough so the engine can slide.
B. Remove belt/bearing guide.
C. Move engine-to-tension belts by means of two (2) engine adjusters at engine frame. Moving the engine forward will decrease the tension on the belts and moving it rearward will increase the tension on the belts.
D. Make certain that the engine and blower sheaves are perfectly aligned. Use a straight edge to check sheave alignment by placing it along the sheave faces.
E. Once tension and alignment are achieved, retighten the four (4) engine hold-down bolts and replace the belt/bearing guard.



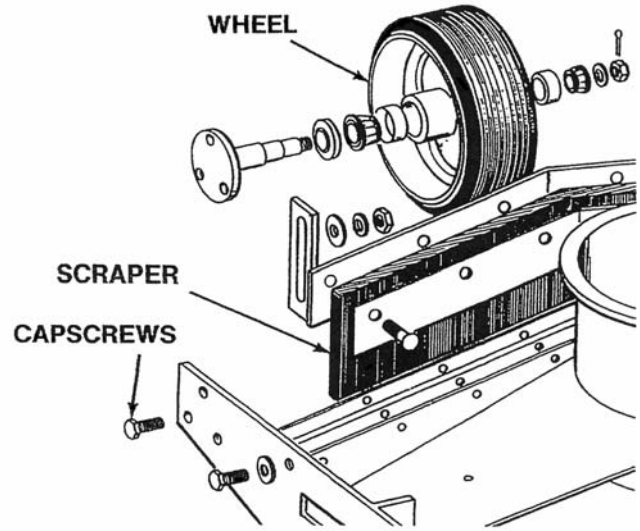
6. NOZZLE ADJUSTMENT
   The gutter nozzle sweeping height must be adjusted to suit the type of material being picked up. To raise or lower the nozzle, turn the adjusting screw on the nozzle linkage. Turn the screw in to raise the front of the nozzle, turn the screw out to lower the front of the nozzle. Adjust the scraper so it is in contact with the pavement. For normal material pickup of sand and stones, the nozzle should be adjusted to have one-half inch clearance at the front of the nozzle. This adjustment can be accomplished by adjusting the screw on the nozzle linkage that will raise and lower the front of the nozzle head. The rear edge of the nozzle may be adjusted for height or wheel wear by rotating the nozzle wheels on their mounting bolt pattern.



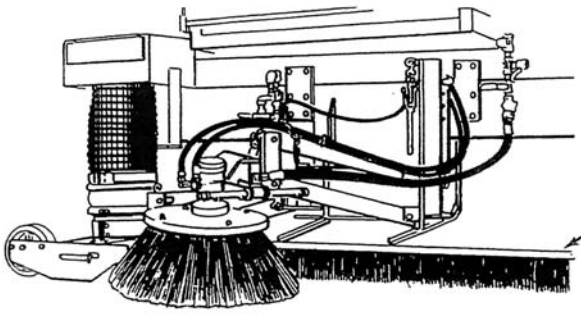
⚠CAUTION

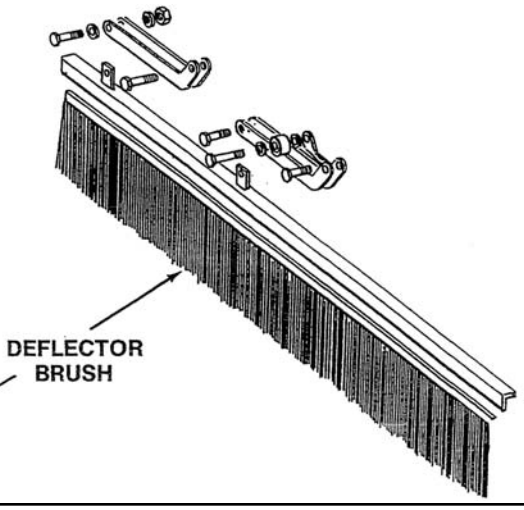
Whenever the vehicle is operated and the nozzles and brooms are not being used, the safety chains must be installed on the nozzle and brooms.

7. NOZZLE WHEEL ADJUSTMENT
   To compensate for wear on the nozzle wheels, the axles are fitted with an adjustment assembly. To adjust, remove the capscrews and turn the axle assembly right or left on the nozzle to adjust the position of the wheels and reinstall the capscrews. With the nozzle level, the wheels should hold the rear edge of the nozzle 5/8" above the pavement. The rubber scraper, located at the rear of the pick-up nozzle, is adjusted by loosening both clamp bolts located at the left and right ends of the nozzle. Adjust the assembly upward or downward to the desired position and retighten the clamp bolts.



8. DEFLECTOR BRUSH
   The deflector brush is initially installed so that the brush lightly contacts the ground and is free to float as the Vac/All is loaded and moves over uneven ground. No further adjustment is required.

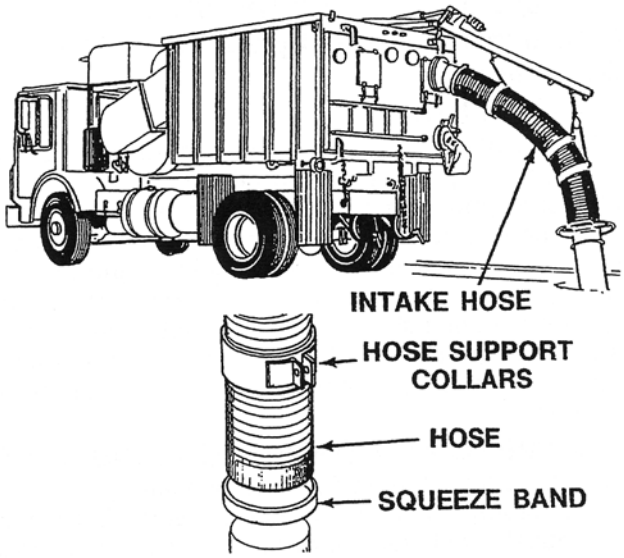


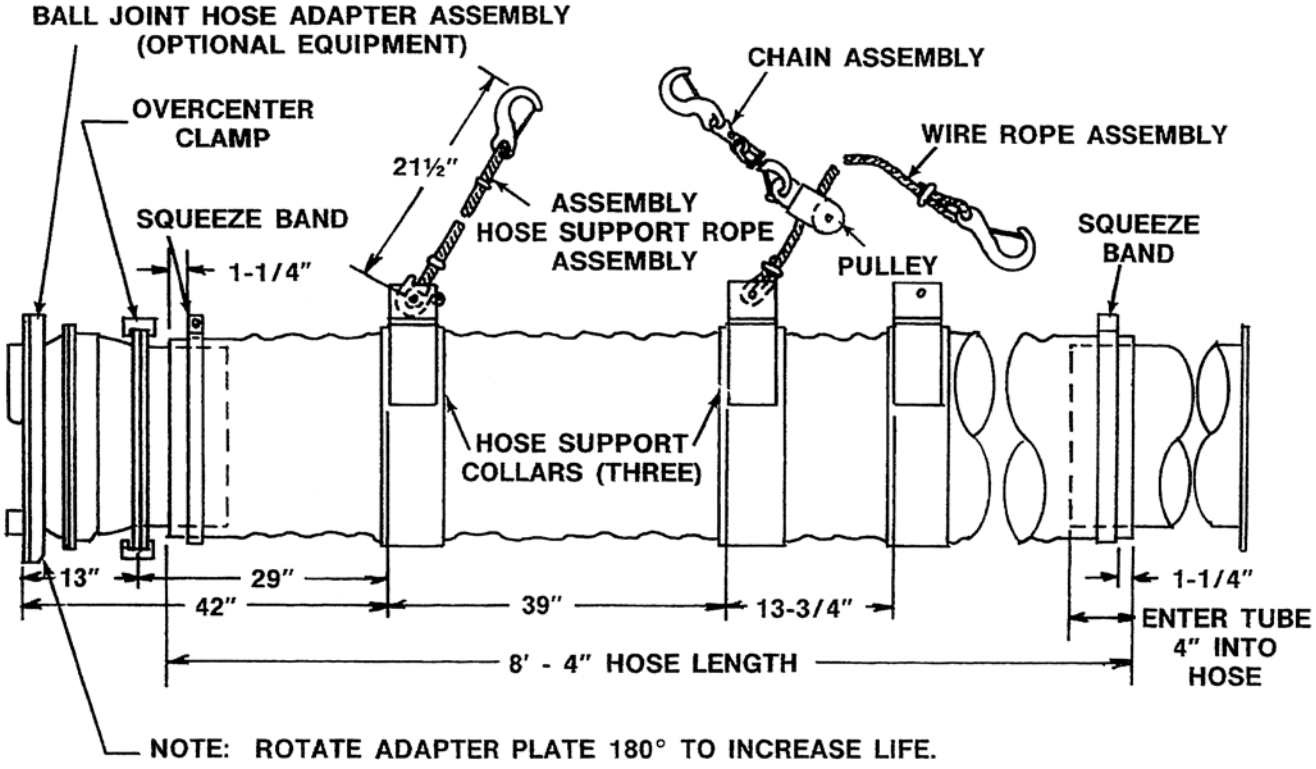


INTAKE HOSE

It should be remembered that intake hoses are made of rubber and fabric and wear should be expected. This wear can be kept to a minimum by employing a few good operation and maintenance practices.

1. Inspect the hose frequently to determine where the most wear is occurring.
2. Rotate the hose periodically to reduce the wear in one spot. Rotating the hose 180º, 90º and end for end periodically will improve the life.
3. Minor cracks, punctures and other leaks should be repaired as soon as they are detected to prevent enlarging to a point where they cannot be repaired. A repair kit is available.
4. Proper spacing of the support collars ensures proper bending radius. Refer to the illustration for proper spacing of support collars.





HYDRAULIC SYSTEM SERVICE (See accompanying hydraulic system illustration)

CONTAMINATION

It is estimated that as much as 90% of all hydraulic problems may be traced directly to the fluid. It is of utmost important that all foreign matter be kept from the hydraulic fluid. Invisible quantities of abrasive type contamination may cause serious pump wear, malfunctioning of pumps and valves, and sludge accumulations within the system in relatively short periods of time. It is also essential that moisture and water be kept from the hydraulic fluids and system.

COMMERCIAL HYDRAULIC FLUID TESTING

Hydraulic fluid samples should be taken periodically for laboratory analysis. The actual sampling method is critical. It should be done based on ANSI Standard B93.19M(R1980). This standard is available from the National Fluid Power Association, 3333 N. Mayfair Rd., Milwaukee, WI 53222.

Samples should be taken from the center of the reservoir when the fluid is at operating temperature and placed in a clean, dry, glass bottle with a non-shedding, screw-on cap. The bottle should be labeled with the date, type of fluid, and model and serial number of the machine.

Two identical samples should be taken. One for laboratory analysis and one for your own preliminary analysis while you are waiting for the lab report.

We recommend the use of commercial laboratory services for analysis of routine fluid samples taken on a regularly scheduled basis. The cost is about $20 to $30 per sample. The most important analysis are particle count, Spectro-chemical analysis, water content, and viscosity.

IN HOUSE HYDRAULIC FLUID TESTING

After your sample has been allowed to stand for 20 to 30 minutes to eliminate all air bubbles, hold the bottle up to the light to check for debris in the fluid and also check whether the fluid is clear or cloudy.

Any visible debris is an indication of a sever solid contamination problem, the souce or which must be corrected immediately. Common sources of this kind of contamination may be component wear, unsealed reservoir covers, or dirty air breather filters.

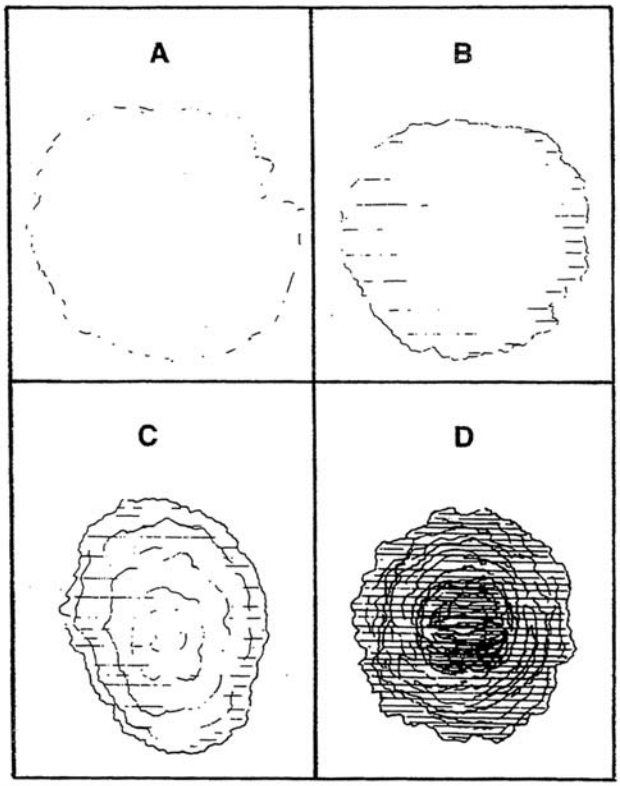
If the sample is the least bit “cloudy,” it is an indication of water contamination, the source of which must be found and eliminated immediately. Common sources are inadequate outdoor storage, unsealed reservoir covers, or condensation.

A “BLOTTER SPOT TEST” may also be performed to test for OXIDATION. Place a DROP of fluid on a piece of white blotter paper. Order Clean Earth part number 102480 for 20 sheets.

NOTE:

The Blotter Test will provide an indication that a more complete test may be necessary.

A. If the blotter remains colorless or developes only a light yellow ring, oxidation is under control.
B. If color developes but is uniform throughout, the fluid is still serviceable, but should be checked for correct additive content.
C. If the sample shows distinct rings, the fluid should be changed.
D. If a distinct dark spot remains in the middle, but a lighter colored fluid migrates outward in the blotter paper, the fluid is about to dump (or already has) sludge or other by-products into the system. The time for replacement of this fluid has already passed.



Kits are available from your fluid supplier to test for acid content in much the same way you would test the condition of swimming pool water. A shift in acid content may indicate a breakdown in the fluid.

KEEP ACCURATE, DATE RECORDS OF ALL PERTINENT INFORMATION GAINED FROM THESE TESTS.

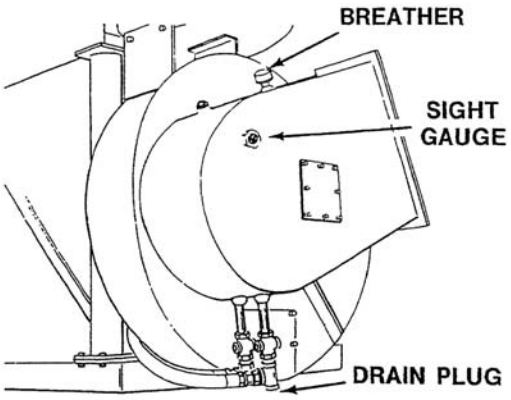
YEARLY PREVENTATIVE MAINTENANCE

1. FLUSHING HYDRAULIC SYSTEM
   A. Annually drain all fluid from the hydraulic tank.

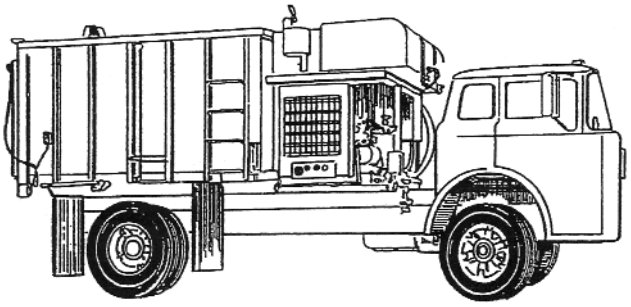
NOTE

To drain the hoist, the body must be fully raised and securely blocked. Remove the vent plug on the top side of the cylinder. Lower the line at the rod end of the upper and lower ends of the cylinder, and drain the fluid into a suitable container. Also, lower both lines at the pump, or remove the pipe plug in the side of the housing and drain the fluid into a suitable container. Move the valve control lever in the cab back and forth several times so that any trapped fluid will be drained from the system. Drain the hydraulic fluid reservoir by removing the drain plug.

   B. Fill the hydraulic tank with fresh fluid as specified in the SPECIFICATIONS Section.
   C. Start the Vac/All engine and operate all hydraulic functions as described in the OPERATORS Manual. Leave all the hydraulic cylinders in the retracted position and shut down the unit.
   D. Recheck the fluid level and add fluid as necessary to bring the level to half way in the sight guage.
   E. Replace the hydraulic tank air breather.
   F. Replace the fibrous hydraulic cylinder air breathers.

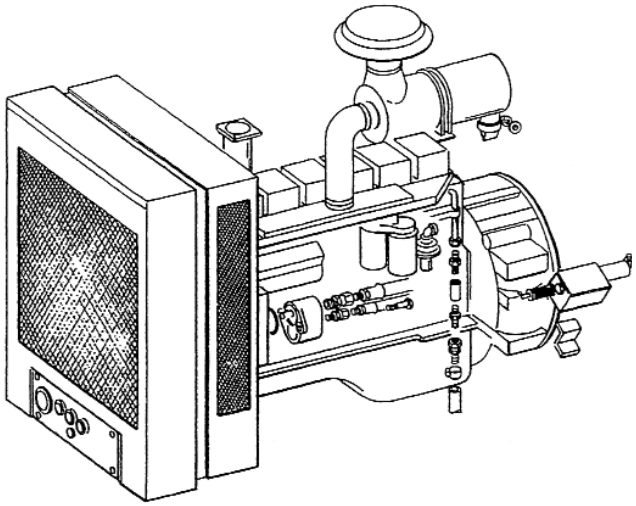


2. SEASONAL STORAGE
   A. If the Vac/All is going to be inactive for long periods of time, or stored, take the following steps to avoid corrosion in the body and air chamber.
      1. Steam clean or sandblast the inside of the body, air chamber, blower housing, and blower.
      2. Repaint with a good primer such as RUSTOLEUM to prevent any corrosive action due to moisture.



BLOWER DRIVE ENGINE PREVENTATIVE MAINTENANCE

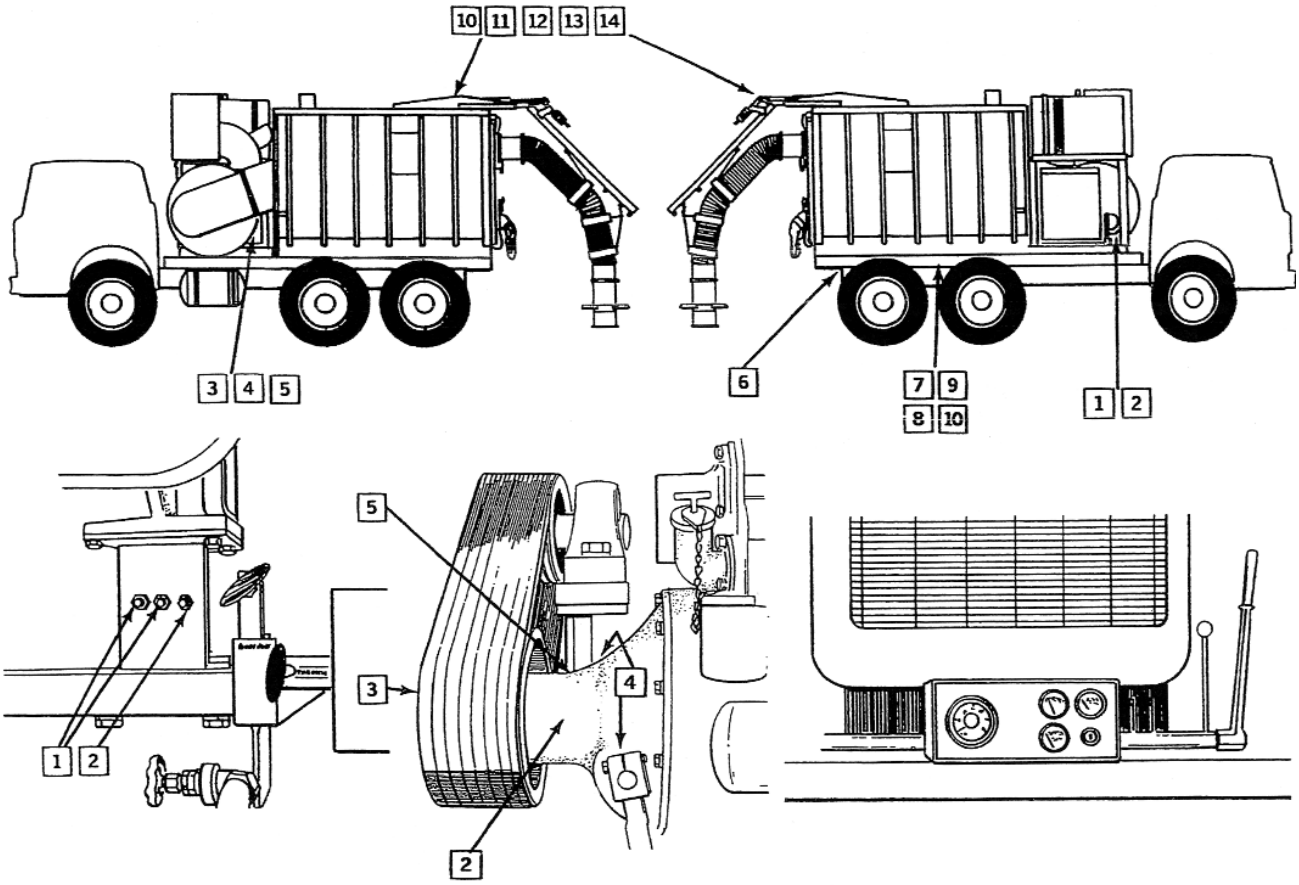
1. Refer to the auxiliary engine manufacturer's service manual for recommended maintenance and checks.



CLUTCH POWER TAKE OFF PREVENTATIVE MAINTENANCE

1. Refer to the Rockford instruction sheets for recommended maintenance checks of the blower clutch.

LUBRICATION CHART



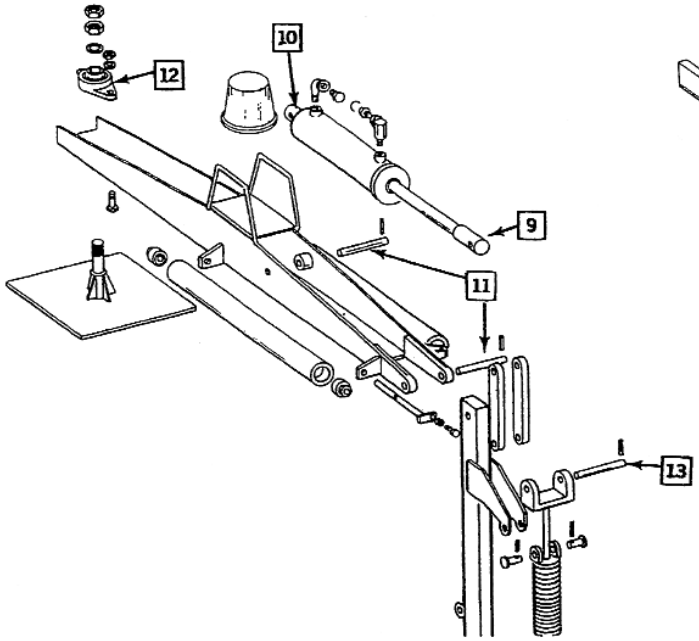
Lubricate the unit at intervals indicated or more frequently in severe or dirty operations. Wipe dirt off grease fittings before applying grease.

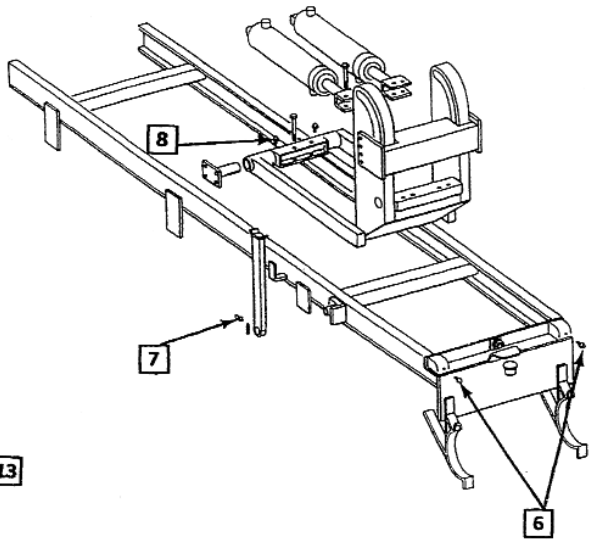
Location	Description	No. of Lube Fittings	Lube Interval Hours
1	Blower Bearings	2	8
2	Clutch Throw-out Collar	1	8
3	Pilot Bearing	1	100
4	Clutch Operating Shaft	2	100
5	Main Shaft Bearing	1	50
6	Body Hoist Rear Hinge	2	40
7	Body Prop	2	40
8	Body Hoist Cylinder, Lower End	3	40
9	Power Boom Cylinder, Upper End	1	40
10	Power Boom Cylinder, Lower End	1	40
11	Power Boom Arm	1	40
12	Power Boom Center Pin Bearing	1	40
13	Power Boom Front Spring Bushing	1	40

NOTE

REFER TO ENGINE & CLUTCH MANUAL FOR REMAINDER OF LUBRICATION INSTRUCTIONS.

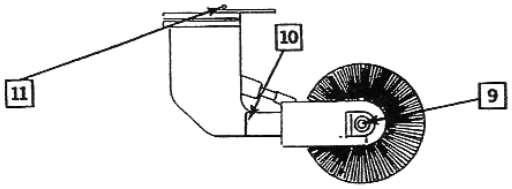
LUBRICATION CHART

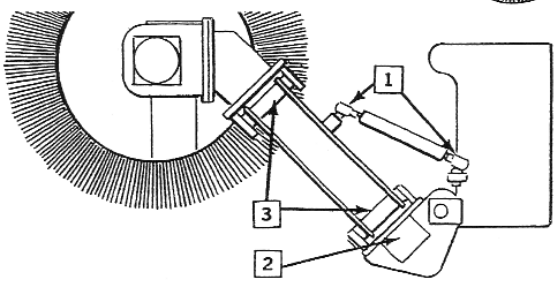


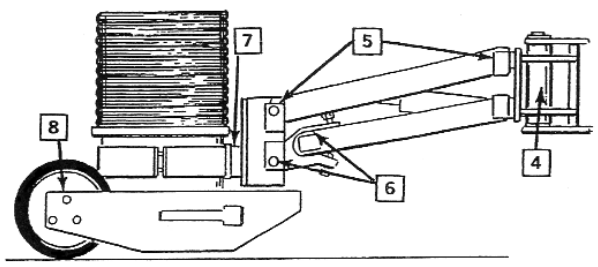


SWEEPER LUBRICATION CHART

Location	Description	No. of Lube Fittings	Lube Interval Hours
1	Tie Rod	2	40
2	Arm Support Bracket	1	40
3	Upper & Lower Arm	3	40
4	Pivot Bracket	1	40
5	Upper Arm	2	40
6	Lower Pivot Link	2	40
7	Nozzle Pivot	1	40
8	Nozzle Wheel	2	40
9	Holder Bearing	1	40
10	Pivot Shaft	2	40
11	Swivel Base	1	40







SECTION 4 TROUBLESHOOTING

GENERAL

Troubleshooting is a matter of quickly and logically isolating the cause of a problem and taking corrective action. Factory trained mechanics, experienced operators, a thorough understanding of the information in this manual and accurate maintenance records are the best troubleshooting tools available. Occassionally it may be best for a service person, who is trying to isolate a problem, to view the unit in operation or consult with operators to determine how the unit is acting under working conditions.

For the most part, problems with the Vac/All will be limited to hydrauic and electrical system component malfunction or control linkage adjustment.

Hydraulic flow diagrams are provided in this section. These diagrams can be helpful in determining which parts are associated with a particular function.

An electrical wiring diagram is included in SERVICE AND REPAIR under ELECTRICAL SYSTEM.

The principal of the Vac/All operation is to move air and material through the intake tube, deposit the material in the body with the air passing through the stainless steel screens and through the front air chamber and exiting through the fan.

In many respects the E5/E10 Vac/All, as well as all other manufacturer's units which utilize a blower fan can be compared to the canister type home vacuum cleaner with which we are all familiar. Unfortunately, the term "vacuum" in itself is somewhat misleading because it is the air movement (velocity) which conveys the debris. "Vacuum" is the measurable difference between the low pressure (vacuum) created inside the body by sucking air out and the atmospheric air pressure on the outside of the body trying to force its way, through the intake hose, into the body. If the outside air cannot rush into the body because of a restricted tube or hose, a static condition is created. Since no air is being moved, no work is being done. This is important: to do work, an adequate amount of air must pass through the intake hose and must be of high velocity.

There are three (3) main components of any Vac/All with a blower type fan; (1) blower, (2) debris body, (3) intake tube or hose.

(1) BLOWER

The blower exhausts air from the body creating a vacuum (negative pressure) in the body. This air is replaced by outside air rushing at very high velocities through the air inlet, either a pick-up tube, catch basin tube or a street cleaning nozzle. The more air that a blower moves (measured in cubic feet per mintute "CFM") the higher the velocity through a given size pick-up tube, which is measured in feet per minute (FPM).

Vac/Alls with fan blowers have a shrouded high pressure blower designed with vanes sandwiched between two (2) steel discs. This shrouded design compresses the air inside the blower and creates a high vacuum inside the body resulting in high air velocity at the hose inlet. This type of construction was designed for its high efficiency as a result of containing the air within a closed blower impeller and thus avoiding the friction and turbulence of an open impeller.

The negative pressure as previously mentioned is simply the measurement of the vacuum in the blower housing as opposed to the air pressure on the outside. Vacuum gauges reading in inches of water are usually used to read negative pressure. The maximum negative pressure for the unit is normally established with all intake ports closed (no load) and the blower engine running at governed engine RPM. The engine will run faster when the air supply is cut off, which is the "no load" condition. When the full volume of air passes through the blower (full load), the engine speed will reduce noticeably due to the increased load.

It should be kept in mind that pressure is only a measure of the ability to overcome resistance, which includes the blower, the body, the hoses and tubes; in itself it will do no work. As resistance is added, the pressure increases, the air volume decreases, and the engine approaches the "no load" condition. Therefore, increased pressure signifies an increase in resistance causing a reduction in air velocity and consequently an overall reduction in the amount of work being done. Increased pressure is required to overcome the resistance of excessive duct work, inefficient filtration, sharp turns in the air movement, long lengths of tubes and the high resistance of small diameter intake tubes and hoses.

(2) BODY
The debris body is manufactured to allow air to be exchanged between the blower fan and intake hose while retaining solids or liquids in the body. This is accomplished by the material entering the hose at a great velocity. Once inside the body, the debris is met by a deflector, which is used to channel the air and material away from the filter screens. The body has a much larger area than the intake tube, the air velocity greatly slows and decreases as it enters the much larger volume of the body. When the velocity decrease, gravity causes the deris to fall out of the air stream. The air then passes through the filter screens located at the top of the body, down the front through the air chamber, and into the blower where the blower exhausts the air back to the atmosphere.

(3) INTAKE HOSE
The intake hose is used to convey material into the body by the velocity of the air combined with the now entrained debris. The constant velocity and volume of air keeps the material moving rapidly through the tube and/or hose into the body.

As standard equipment, the Vac/All is supplied with a 12” intake hose, which has an area of 113 square inches and has less than one half the resistance as compared to competitors with an 8” diameter, 50 square inch area hose. This is why many of our competitors who use an 8” hose have higher ratings in the amount of negative water pressure. The increase in pressure is needed to overcome the greater resistance due to the smaller diameter tubes, ducts, and cyclones. It’s worth repeating...to do work, a great deal of air has to move and move fast! Velocity and volume are the major factors when considering a machine’s capabilities. Velocities entering the 12” diameter intake tube will be approximately 175 MPH on a standard Vac/All and even greater on our industrial type units.

Another advantage of the 12” hose is that it is also less likely to plug with large objects such as bricks, bottles, large cans, tree branches, etc. Keep in mind, however, that where space limitations exist, the Vac/All can operate with one or two 6” and 4”. An outstanding feature of the Vac/All is the capability and flexibility of the 12” inlet.

Below are listed some of the problems that may occur and the required adjustments and corrections that should be made.

SECTION 4 TROUBLESHOOTING

POSSIBLE CAUSE	REMEDY

VAC/ALL DOES NOT PICK UP MATERIAL

1. Dirty screens.	1. Wash or scrape the screens so air can pass through.
2. Belts slipping.	2. Adjust belt tension, see Section 3, Preventative Maintenance.
3. Intake plugged.	3. Obstruction in tube or hose, disconnect the tube or hose and use a scraper to push or pull material from the tube.
4. Body full.	4. Dump the load.
5. End of intake too close to material.	5. A sufficient amount of air must be allowed to enter the tube to carry material into the body.
6. Clutch slipping.	6. Refer to clutch manual for proper adjustment of clutch.

BODY DOES NOT FILL COMPLETELY

1. Deflector on tailgate positioned too low.	1. Raise deflector to a higher position to allow material to fall closer to the front of the body.

WATER DISCHARGED THROUGH BLOWER EXHAUST

1. High water level in body.	1. Remove water from body by draining through drain hose on the tailgate or by dumping load.
2. Front air chamber full of water.	2. Remove the cleanout on both sides of the air chamber, wash out and drain.
3. Deflector on the tailgate is not in the down position.	3. Lower the deflector.
4. Running Vac/All at full throttle with the body half full of water or more.	4. Reduce engine speed to idle and advance throttle only to RPM required to vacuum material.
5. The hinged front deflector inside the body is not in its raised and pinned position.	5. Raise the deflector and pin.
6. Hole in tailgate deflector.	6. Repair or replace deflector.

POSSIBLE CAUSE	REMEDY

SHORT CLUTCH LIFE

1. Over lubricated.	1. See instructions in the operators manual and Section 3. Preventative Maintenance for proper lubrication of clutch.
2. Slipping clutch for long periods of time.	2. Do not slip clutch for long periods as heat builds up rapidly. Refer to clutch manual.

CLUTCH ENGAGES AND DISENGAGES HARD

1. Clutch linkage not lubricated.	1. Lubricate clutch per Section 3, Preventative Maintenance.
2. Clutch adjusted too tight.	2. Refer to clutch manual for proper adjustment of clutch.

WATER TANK IS BULGED OR SPLIT OPEN

1. Excessive hydrant pressure after water tank is full.	1. Ensure water tank over flow hose is not kinked. Reduce hydrant pressure as tank nears full mark.

INADEQUATE WATER PRESSURE FROM THE JETTING PUMP

1. Pump air locked.	1. Replace seal.
2. Plugged strainer.	2. Tighten turn buckles if water is leaking along the bottom of tailgate.
3. Frozen line.	3. Loosen seal retainer bolts in affected area and adjust seal.
4. Water pump drive belt slipping.	4. Adjust belt tension.
5. Pump clutch is worn or out of adjustment.	5. See Section 5, Service & Repair.
6. Pump impeller worn.	6. Replace impeller.

WATER DOES NOT DRAIN FROM BODY THROUGH TAILGATE SUMP

1. Dirt plugging hose.	1. Clean hose daily.
2. Dirt plugging baffle inside body.	2. Clean sump baffle.

DUST COMING THROUGH BLOWER EXHAUST

1. Inadequate supply of water.	1. Apply more water to material.
2. Too great of velocity for material being conveyed.	2. Cut back on RPMs.

POSSIBLE CAUSE	REMEDY

EXCESSIVE VIBRATION AT BLOWER

1. Blower wheel extremely dirty.	1. Steam clean blower wheel and interior of blower housing.
2. Blower wheel is out of balance.	2. Rebalance blower wheel, see Section 5, Service & Repair.
3. Damaged bearing on engine clutch.	3. Replace bearing, see clutch manual.
4. Damaged bearing(s) on blower wheel.	4. Replace bearing, see Section 5, Service & Repair.

HYDRAULIC FLUID FOAMING

1. Insufficient fluid in system.	1. Check fluid level as outlined in operator manual and Section 3, Preventative Maintenance.
2. Fluid too thick.	2. See Section 2 for proper selection of fluid.
3. Leak in suction hose or fittings.	3. Check suction line to pump.
4. Overspeeding engine when dumping load.	4. Run engine at a constant 1500 RPM, see operators manual.

BODY RAISES UNSTEADILY AND JERKS OR VIBRATES

1. Excess air in system.	1. Vent cylinder(s), if trouble reoccurs, look for some of the causes as listed under Section 4, Troubleshooting, Failure to Raise Load.

BODY WILL NOT HOLD

1. Control linkage not allowing full travel of valve spool.	1. Check linkage, see Section 5, Service & Repair.
2. Cylinder(s) bypassing fluid.	2. Repack or replace cylinder(s).

BODY SLOW IN RAISING

1. Pump worn.	1. Repair or replace, see Section 5, Service & Repair.
2. Control linkage not allowing full travel of valve spool.	2. Check linkage, see Section 5, Service & Repair.
3. Low relief valve setting.	3. Check relief setting, see Section 5, Service & Repair.
4. Scored valve spool or body.	4. Replace Assembly, see Section 5, Service & Repair.
5. Relief valve not seating.	5. Repair or replace.
6. Cylinder(s) bypassing.	6. Repair or replace.

POSSIBLE CAUSE	REMEDY

BODY SLOW IN LOWERING

1. Control linkage not allowing full travel of valve spool.	1. Check linkage, see Section 5, Service & Repair.

SWEEPER NOZZLE DOES NOT LOWER

1. Control panel is not turned on or switch is faulty.	1. Turn control panel on, see operators manual.
2. Battery is dead on Vac/All engine.	2. Charge or replace battery.
3. Solenoid on sweeper hydraulic panel is inoperative.	3. Try to manually override the valve, if the nozzle lowers there is an electrical problem. If it does not, repair or replace the valve.

SWEEPER NOZZLE PLUGS UP

1. Insufficient water to the nozzle deflector.	1. Open ball valve to allow more water to the nozzle.
2. Material being swept is too large to get through the 12” hose.	2. Avoid long sticks, branches, exhaust pipes, etc.

DIRT FOLLOWS THE GUTTER BROOM AROUND

1. The gutter broom is too flat.	1. Adjust the linkage arm on the broom so less broom surface is on the street, see Section 3, Preventative Maintenance.

SHORT BROOM LIFE

1. Broom is turning too fast.	1. Slow down the speed of the broom.
2. Too much broom surface on the street.	2. Adjust linkage, see Section 3, Preventative Maintenance.
3. Too much broom pressure.	3. Adjust balance spring, see Section 3, Preventative Maintenance.

POSSIBLE CAUSE	REMEDY

HEAVY DUST AROUND THE BROOM(S)

1. Spray bar is not turned on.	1. Turn on spray bar and open ball valve for water volume.
2. Water nozzles are plugged at the spray bar.	2. Remove nozzles and clean.
3. Broom speed too fast.	3. Slow down broom speed in heavy sweepings.

MATERIAL SWEPT IS BEYOND PATH OF NOZZLE

1. Broom(s) speed is too fast.	1. Slow down the broom speed.
2. Deflector broom is not down.	2. Check linkage.
3. Deflector broom worn.	3. Replace deflector broom.
4. Wrong angle on gutter broom or transfer broom.	4. See Section 3, Preventative Maintenance for proper adjustment of broom.

SWEEPER NOZZLE CREEPS DOWN FROM UP POSITION

1. Lift cylinder bypassing fluid.	1. Repair or replace cylinder.
2. Solenoid valve is malfunctioning.	2. Repair or replace valve.
3. Check valve is malfunctioning.	3. Repair or replace valve.

GUTTER BROOM AND DEFLECTOR NOZZLE DOES NOT LOWER

1. Control console switch is not in the “on” position.	1. Turn control switch to “on” position, see operators manual.
2. Battery dead.	2. Recharge or replace battery.
3. Solenoid valve on hydraulic panel faulty.	3. Try to manually override valve.
4. Broom linkage needs lubrication.	4. Refer to Section 3, Preventative Maintenance.
5. Broom cylinder damaged.	5. Repair or replace cylinder.

GUTTER BROOM DOES NOT TURN

1. Control console switch is not in the on position.	1. Turn control switch to “on” position, see operators manual.
2. Rheostat control set too low.	2. Rotate switch to increase flow to broom motor.
3. Solenoid valve malfunctioning at hydraulic panel.	3. Try to manually override valve.

GUTTER BROOM LEAVES STREAK BETWEEN THE BROOM AND NOZZLE

1. Broom is not adjusted properly.	1. Adjust the gutter broom linkage arm to get more broom surface area on the street. See Section 3, Preventative Maintenance.

SHORT INTAKE HOSE LIFE

1. Working the hose with extreme sharp bends.	1. Allow boom to support and guide hose.
2. Not rotating the hose.	2. The hose should be turned every two months or more often under severe conditions.
3. Raising tailgate with intake hose.	3. Use chain attached to power boom & tailgate.
4. Traveling with boom in lowered position.	4. Allow the boom to carry the hose.
5. Improper spacing of support collars.	5. See Preventative Maintenance section for proper spacing of collars.

POSSIBLE CAUSE	REMEDY

POWER BOOM DOES NOT OPERATE

1. Battery dead.	1. Check battery on Vac/All engie.
2. Pendant cord has a broken wire.	2. Short across the solenoid of the hydraulic boom pump. If boom operates, it is either a broken wire or a bad switch. If boom does not operate when shorting across solenoid, the solenoid may be bad. Open switch and short across switch. If boom operates, there is a broken wire in the pendeant cord. Replace cord.
3. Motor is burned out.	3. If the boom only goes down and out and not up, either the external solenoid is damaged or the motor is burned out and therefore should be replaced.

POWER BOOM FAILS TO RAISE TO MAXIMUM HEIGHT

1. Boom reservoir is low on hydraulic fluid.	1. Fill reservoir to within 1” of cap.

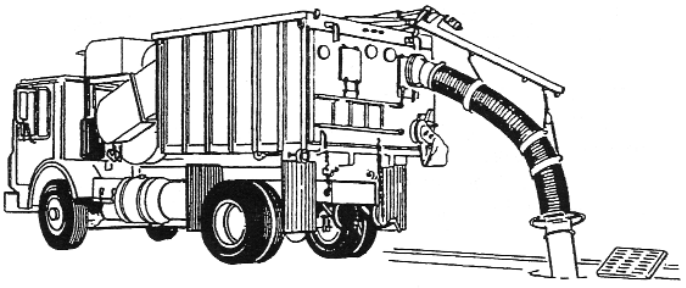
ENGINE PROBLEMS

1. Auxiliary engine will not start or run properly.	1. Refer to engine manufacturer’s manual.

DESCRIPTION OF HYDRAULIC SYSTEM

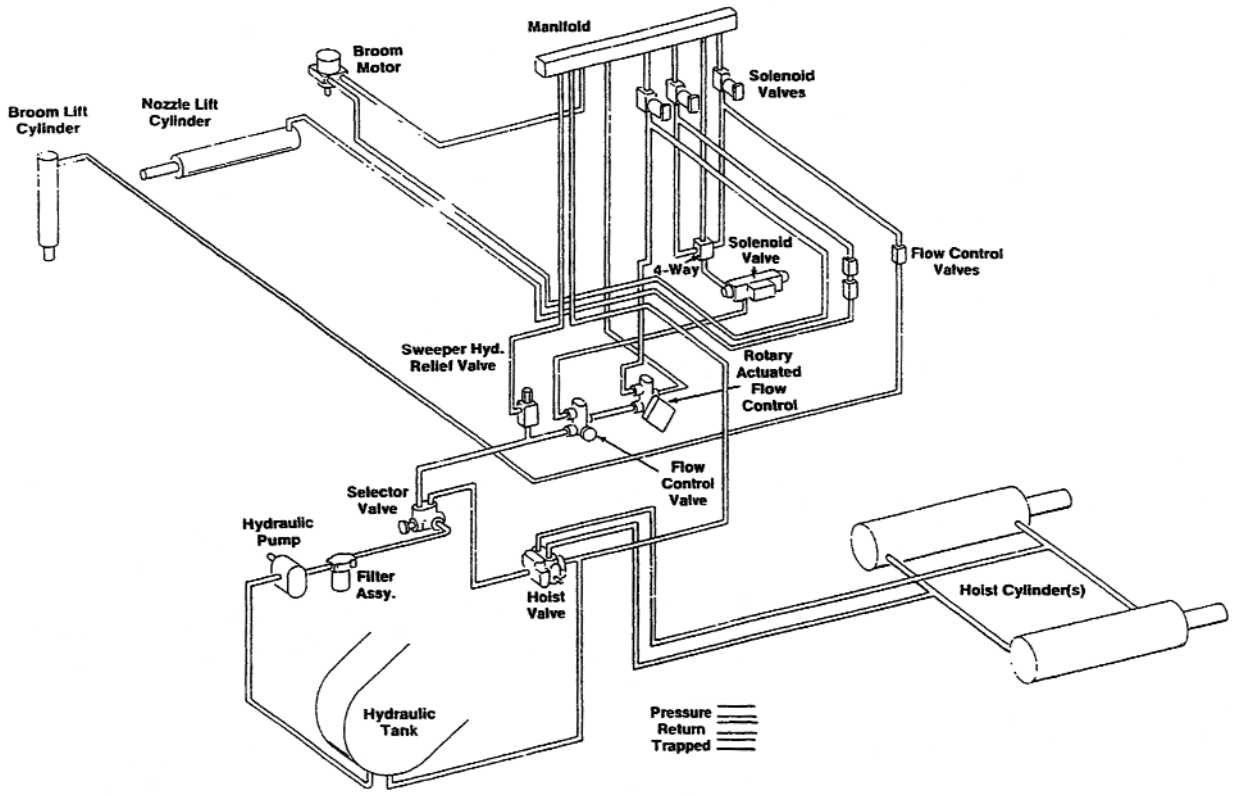
The following is a decription of what happens in the hydraulic system during the operation of the Vac/All Model E5.

Operator action is presented and then a description of hydraulic flow and the interaction of system components (i.e., valves, motors and cylinders) follows. Before proceeding, refer to the illustrations and become familiar with the sytem component nomenclature.



⚠CAUTION

The operator action is presented then a written description follows. Refer to the specific flow charts for the described function. Many combinations of hydraulic functions are possible. Only those commonly used are presented. It may be necessary to refer to more than one illustration for a specific combination.



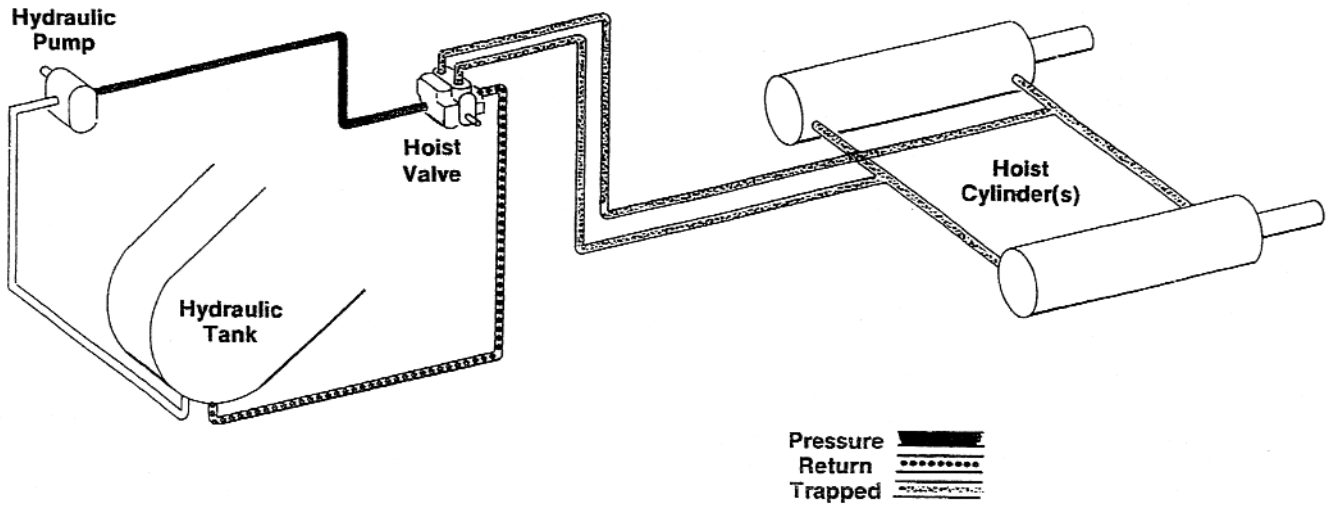
DUMPING OF BODY E5
OPERATOR ACTION
The operator starts the auxiliary engine, advancing to a minimum of 1500 RPM.

HYDRAULIC SEQUENCE
With the hoist valve in its neutral position, fluid enters the hoist valve from the hydraulic pump and exits the exhaust port of the hoist valve returning the fluid to the hydraulic tank.

⚠CAUTION

The operator action is presented then a written description follows. Refer to the specific flow charts for the described function. Many combinations of hydraulic functions are possible. Only those commonly used are presented. It may be necessary to refer to more than one illustration for a specific combination.

E5 Start Engine



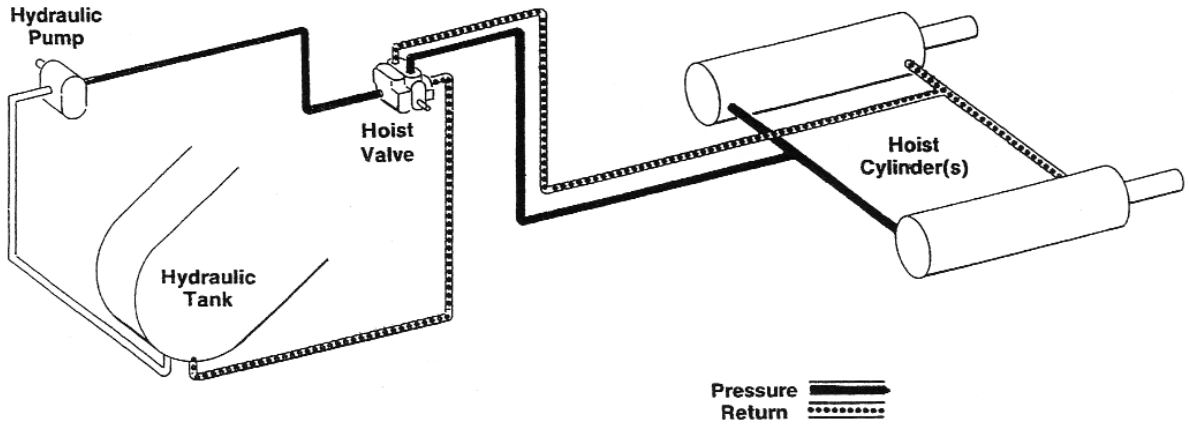
E5 Hoist Up

DUMPING OF BODY E5
OPERATOR ACTION

The hoist valve control cable is now pulled to its out most position and released when the body has completely raised.

HYDRAULIC SEQUENCE

Pulling the hoist valve control cable out moves the spool in the hoist valve and directs fluid to the case end of the hoist cylinder(s), raising the body. Fluid from the rod end of the cylinder(s) is returned to the hydraulic tank. Releasing the control cable to neutral will again return fluid to the hydraulic tank while trapping the fluid in the hoist cylinder(s).



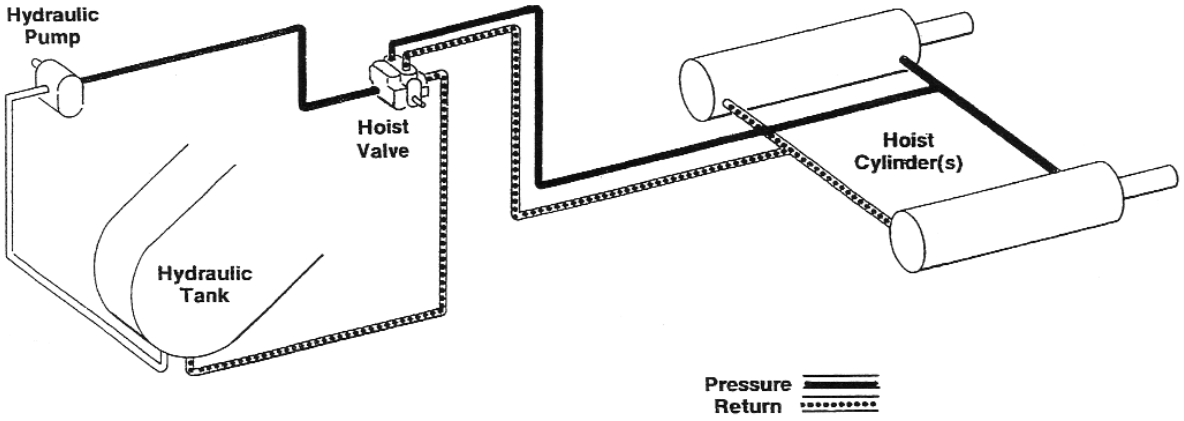
E5 Hoist Down

DUMPING OF BODY E5
OPERATOR ACTION

After dumping, the control cable is pushed in to lower the body and released when the body is completely lowered.

NOTE

The hoist valve is equipped with a built-in relief factory set to 1500 PSI. Should the pressure in the hoist system raise to 1500 PSI, the relief valve will open, stabilizing the pressure and protecting the hoist hydraulic circuit.



HYDRAULIC SEQUENCE

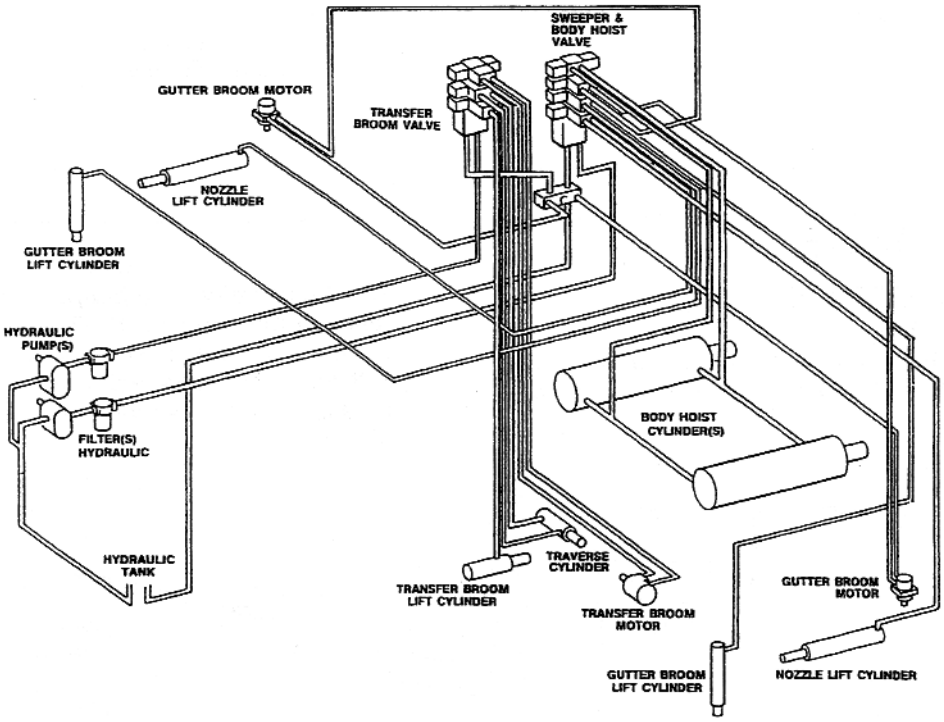
Pushing in on the hoist control cable moves the hoist valve spool in the opposite direction, directing fluid to the rod end of the hoist cylinder and lowering the body. Fluid from the case end of the cylinder(s) is returned to the hydraulic tank.

Releasing the control cable to the neutral position will return fluid to the hydraulic tank while trapping fluid in the hoist cylinders.

E5/E10 Sweeper

SYSTEM COMPONENT NOMENCLATURE DESCRIPTION OF HYDRAULIC SYSTEM

The following is a description of what happens in the hydraulic system during the operation of the Vac/All model E5/E10 with a sweeper attachment. Many combinations of hydraulic functions are possible, depending on how the unit was ordered. You will find illustrated a dual sweeper with transfer broom. Your unit may not be equipped in this manner, but the fluid's path of flow will be the same. If your unit lacks a left-hand sweeper assembly or transfer broom assembly, please disregard that section of the flow chart.



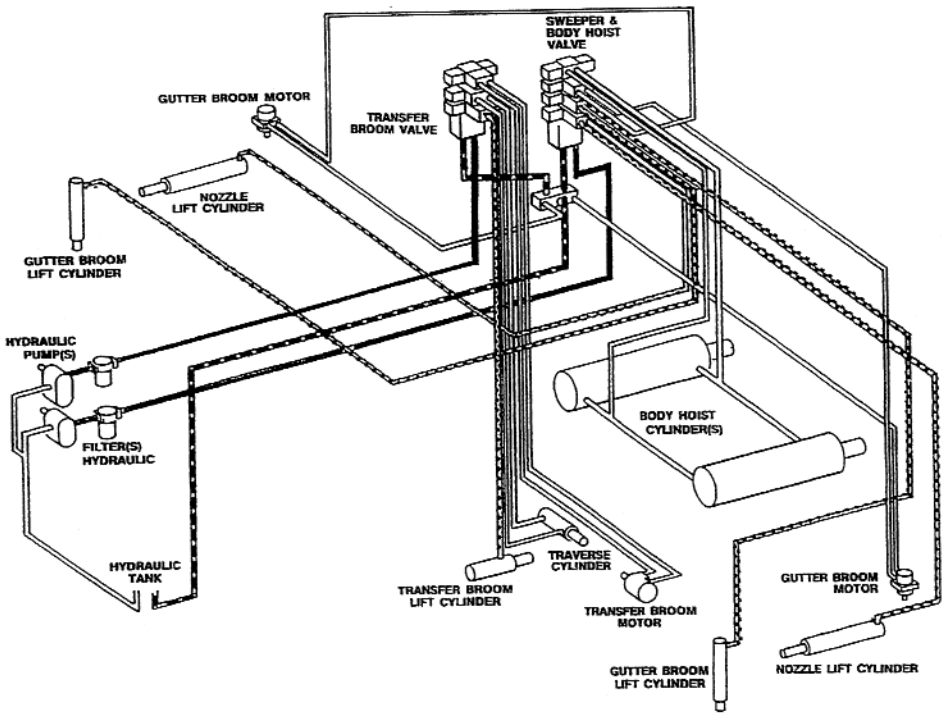
E5/E10 Sweeper

OPERATOR ACTION
The operator starts the Vac/All engine and advances the engine's rpm to a minimum of 1500 rpm.

HYDRAULIC SEQUENCE
Fluid flows from the hydraulic tank to the pump(s). The hydraulic pump output is 10.5 gpm at 220 rpm on the single gear pump used on sweepers that do not have the transfer broom option. On units with a transfer broom, we use a dual section hydraulic pump, which has the same 10.5 gpm at 2200 rpm for the sweeper and body hoist sections and 7 gpm at 2200 rpm rated pump for the transfer broom valve section.

The pump(s) will direct flow through the pressure filter(s) and on to the control valve(s). At the control valve(s), the fluid will meet a closed solenoid valve, which directs the fluid back to the hydraulic tank.

E5/E10 Engine Start

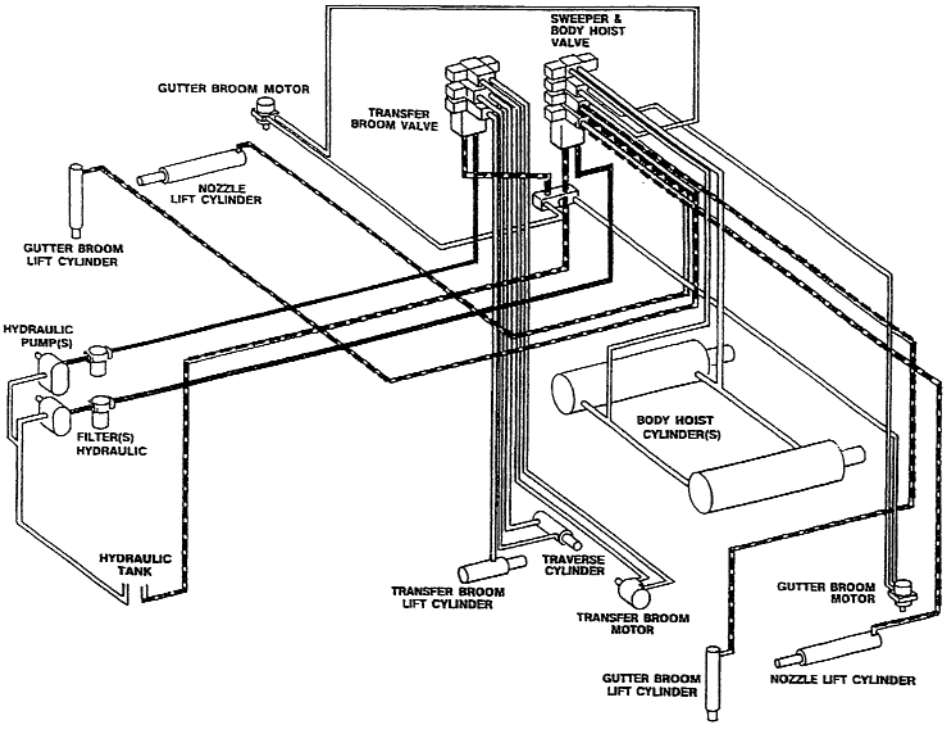


Pressure ═══
Return - - - -
Trapped .....

E5/E10 Sweeper Nozzle & Broom Down

OPERATOR ACTION
The operator positions the nozzle and/or the broom lower/raise switch to its lower position and releases.

HYDRAUIC SEQUENCE
Hydraulic fluid follows the same path as described earlier. However, by positioning the nozzle/broom switch to its lowered position the normally closed solenoid valve is opened, allowing the trapped fluid in the nozzle or broom lift cylinder to be returned to the hydraulic tank, lowering the nozzle or broom.



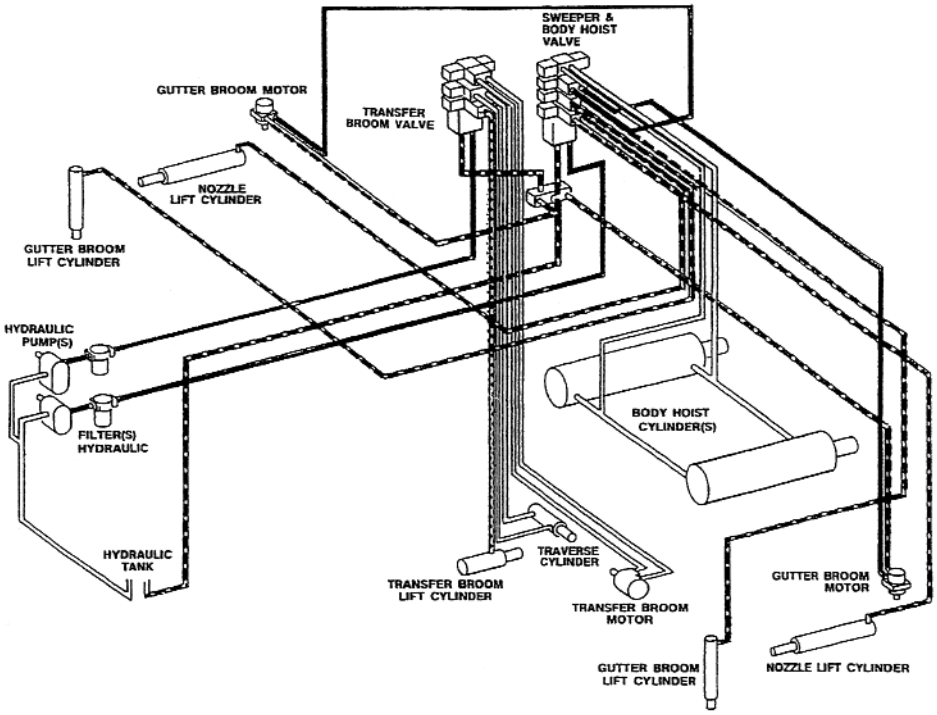
Pressure
Return
Trapped

Clean Earth VAC/ALL

E5/E10 Sweeper Gutter Broom Motor On

OPERATOR ACTION
The operator positions the gutter broom on/off switch to the “on” position and releases.

HYDRAUIC SEQUENCE
With this action, the solenoid valve, which was in a “closed” position, is now opened allowing fluid to flow through the valve block to the four-way solenoid valve and on to the gutter broom motor. The amount of fluid (which controls the speed) at the gutter broom is dictated by the rheostat switch at the control console. Any excess fluid that is not required by the broom motor is directed over a solenoid operated relief and the path of flow is back to the hydraulic tank.



Pressure
Return
Trapped

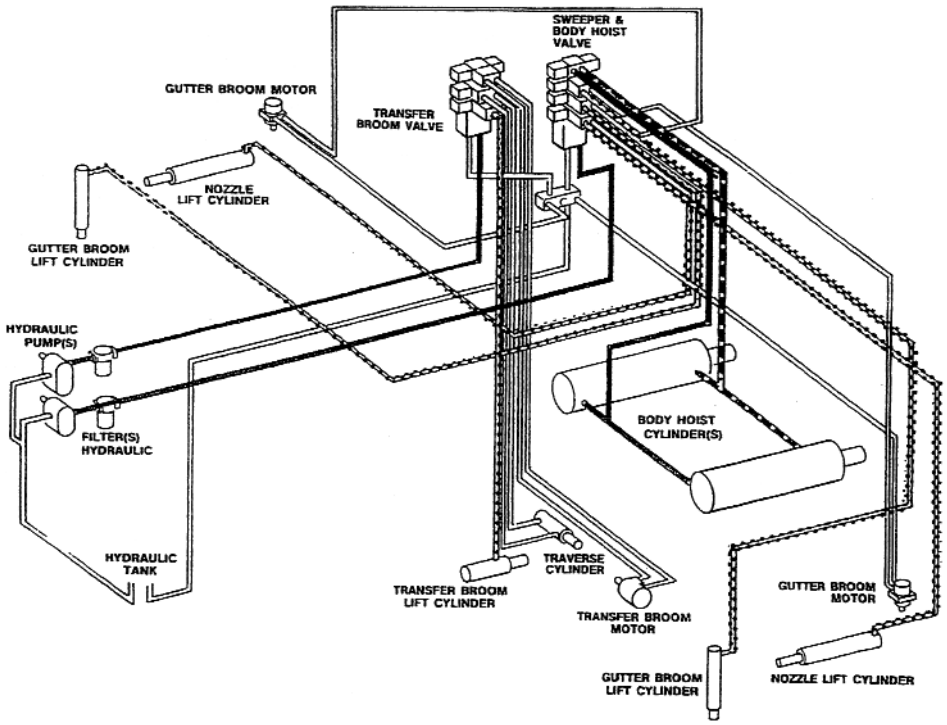
E5/E10 Hoist Up/Down

DUMPING OF BODY E5 & E10 WITH SWEEPER

OPERATOR ACTION

The operator positions the body hoist switch in the “raise” position and holds it until the hoist cylinder has fully extended. To lower, the operator positions and holds the switch in the “lower” position until the hoist cylinders are fully retracted.

With this action, the solenoid valve that was in the “closed” position is now opened, allowing fluid to flow through the valve block to the four (4)-way solenoid valve and on to the body hoist cylinder, raising the body. Since the hoist cylinders are double acting cylinders and the valve is four way, the path of fluid is reversed from the raising of the body.



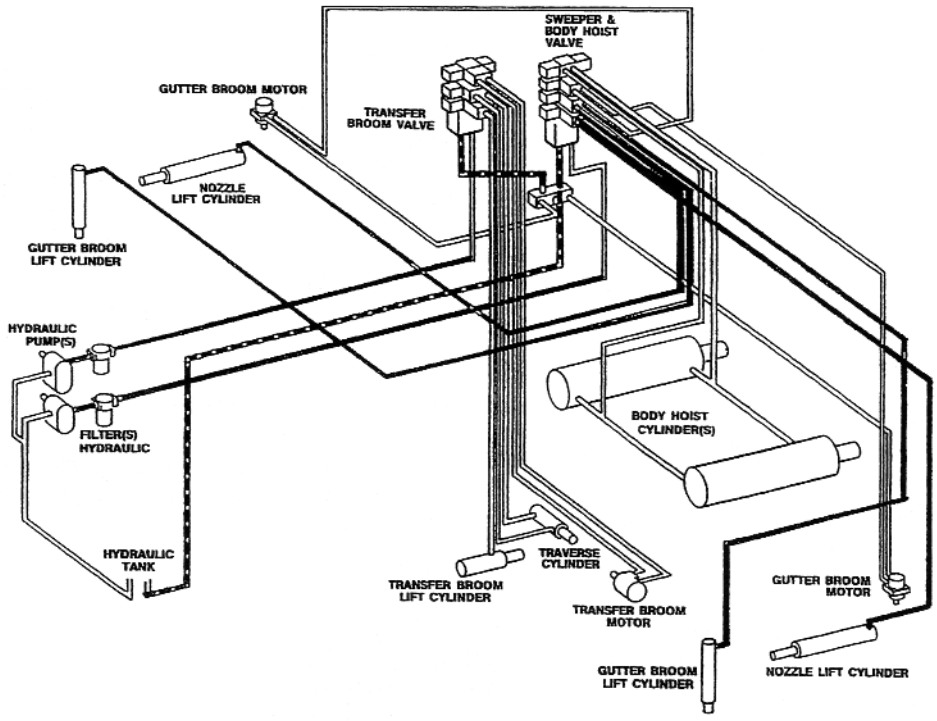
Pressure ——————
Return - - - - -
Trapped .....

Clean Earth VAC/ALL

E5/E10 Sweeper Nozzle/Broom Up

OPERATOR ACTION
The operator positions the broom and/or the nozzle lower/raise switch to the “raise” position and releases it after replacing the broom motor switch in the “off” position.

HYDRAULIC SEQUENCE
The four (4) way solenoid valve is now shifted to direct fluid to the nozzle or broom lift cylinders.

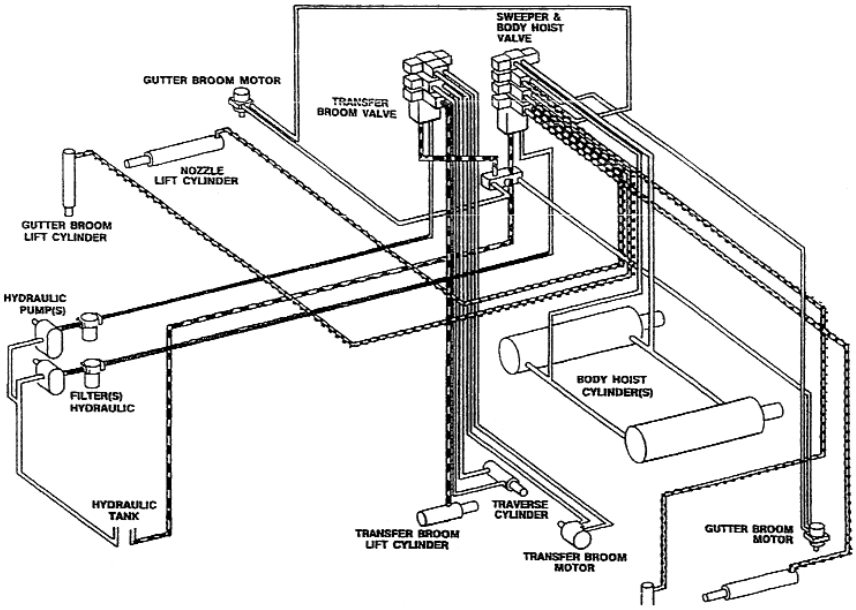


Pressure ——————
Return - - - - -
Trapped .....

Transfer Broom Functions
E5/E10 Transfer Broom Down

OPERATOR ACTION
The operator positions the transfer broom raise/lower switch in the “lower” position and releases it.

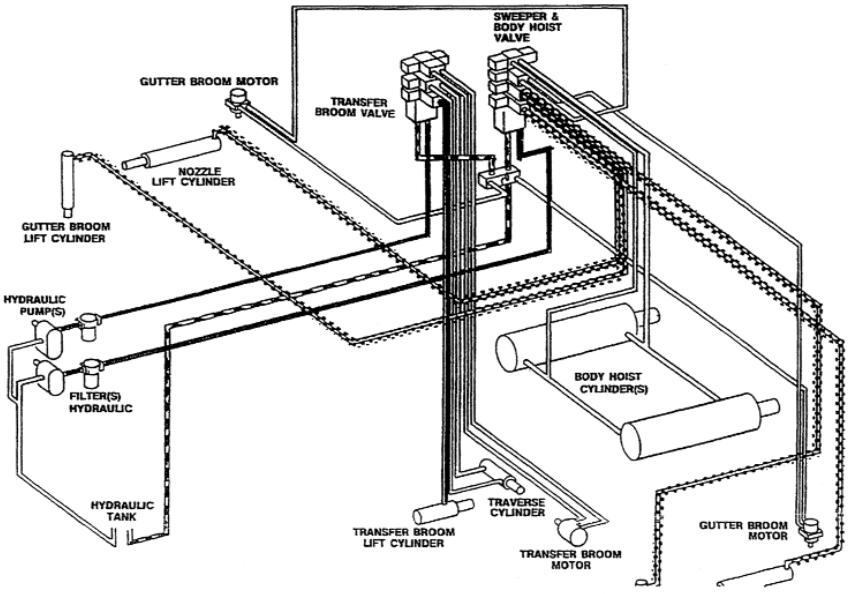
HYDRAULIC SEQUENCE
Hydraulic fluid passes through the valve block by opening the closed solenoid valve at the transfer broom control valve. By opening the solenoid valve, the weight of the transfer broom directs the fluid back of the hydraulic tank.



E5/E10 Transfer Broom Up

OPERATOR ACTION
The operator positions the transfer broom raise/lower switch in the “raise” position and holds it until the broom is fully raised and then releases it.

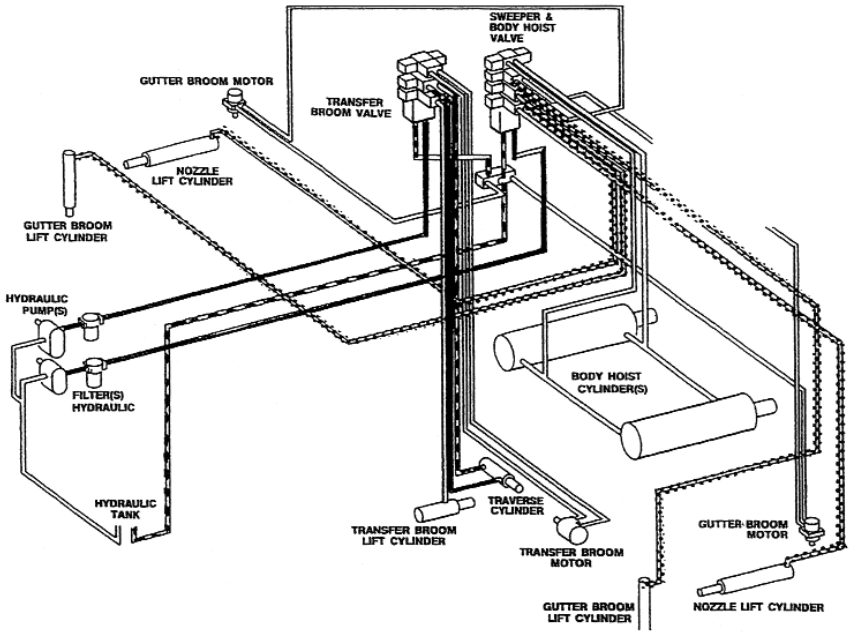
HYDRAULIC SEQUENCE
Hydraulic fluid flows through the valve bank by opening the solenoid valve. The four (4) way solenoid valve is at the same time shifted to direct flow to the broom lift cylinder.



E5/E10 Transfer Broom Traverse

OPERATOR ACTION
The operator depresses the broom traverse switch to either the left or right and releases it.

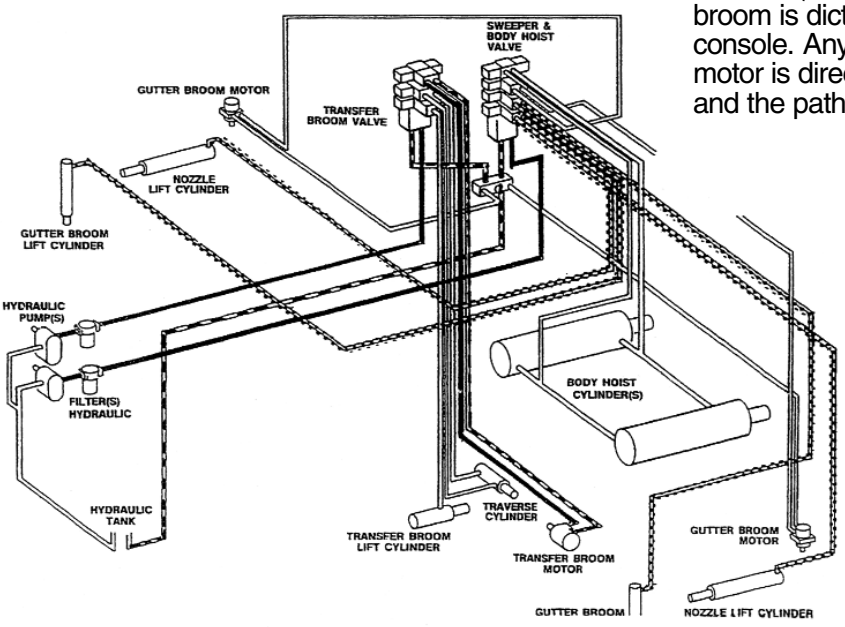
HYDRAULIC SEQUENCE
Hydraulic fluid flows through the valve bank by opening the solenoid valve. The four (4) way solenoid valve for traverse is at the same time shifted, directing flow and return to either the case end or rod end of the cylinder, depending on the right or left hand selection.



E5/E10 Transfer Broom Traverse

OPERATOR ACTION
The operator positions the transfer broom on/off switch to the “on” position and releases it.

HYDRAULIC SEQUENCE
With this action, the solenoid valve, which was in a “closed” position, is now opened, allowing fluid to flow through the valve block to the four (4) way solenoid valve and on to the transfer broom motor. The amount of fluid (which controls the speed) at the transfer broom is dictated by the rheostat switch at the control console. Any excess fluid that is not required by the motor is directed over a solenoid operated relief valve and the path of flow is back to the hydraulic tank.



SECTION 5 SERVICE AND REPAIR

GENERAL

This section contains instructions necessary for the repair and replacement of main components of the E5/E10 Vac/All.

Before attempting any repair of the unit, become thoroughly familiar with the Operator's Manual. Also, before performing any work on the unit, know and OBSERVE ALL SAFETY PRECAUTIONS listed in this and the Operators Manual.

GENERAL

HOIST CYLINDERS

The cylinder is made of seamless steel tube bored and honed on the inside. Cylinder heads can be removed for servicing. Piston rings prevent fluid leakage around the piston.

Most cylinder parts can be serviced as shown on the parts list. Any machining repairs to the inside diameter of the cylinder may result in excessive clearance and should not be attempted.

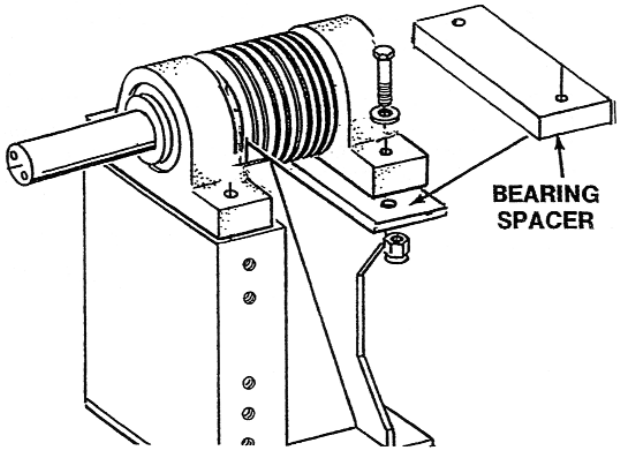
DRIVE BELT REPLACEMENT PROCEDURE

1. Loosen the four (4) engine hold down bolts just enough to slide the engine. Remove the belt guard.
2. Move the engine toward the bearings by means of the two (2) engine adjusters. Slip the belts over the engine sheave.
3. Remove the two (2) bolts from the outboard blower bearing and remove the bearing spacer located under the bearing.
4. Remove the V-belts.
5. Install the new belts over both the sheaves. Use care in installing the new belts so they are not damaged. Prying the belts over grooves of the sheaves could result in cutting the belt cover, leading to subsequent premature breakage. Use only a matched set of vibration tested Clean Earth original factory belts.
6. Reinstall the bearing spacer and two (2) capscrews. Use only Grade 5 or greater capscrews with a lock nut and tighten to 378 ft. lb.
7. Tension the belts by moving the engine away from the blower bearing by means of the two (2) engine adjuster screws. Make certain that the engine and blower sheaves are perfectly aligned. Use a straight edge to check sheave alignment by placing it along the sheave faces. Rotating each sheave a half revolution and checking again for alignment will determine whether the sheave is adequate and the shaft is true.

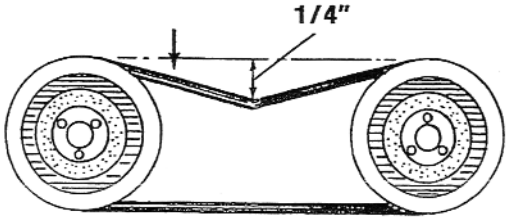
NOTE

NORMAL TENSION: (USED BELTS) Adjust the engine take-up to tension the belts so a force of 16# is required to deflect each banded belt 1/4" at the center of the span as shown.

8. Retighten the four (4) engine hold down bolts. Replace the belt guard.



INITIAL TENSION: (NEW BELTS) Adjust the engine take-up to tension the belts so a force of 20# is required to deflect each banded belt 1/4" at the center of the span as shown. The higher force is necessary to compensate for the initial stretch and wear-in experienced with new belts. After 2 or 4 hours of operation, re-tension to 18# of force. After 48 hours of operation, re-tension the belts to a tension of 16# with 1/4" deflection.



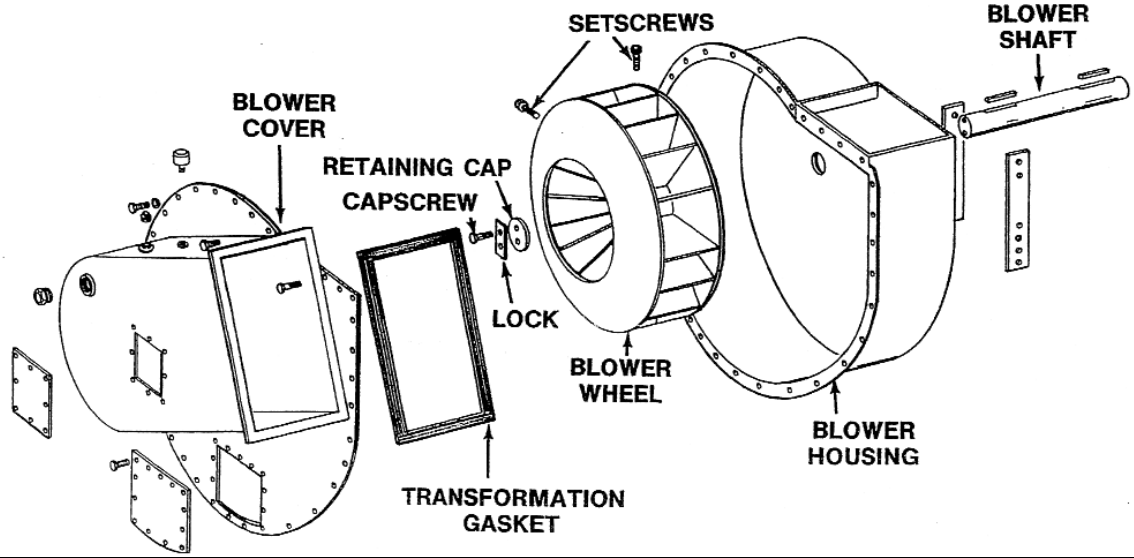
BLOWER HOUSING & WHEEL REMOVAL AND INSTALLATION

1. Remove the blower silencer or exhaust duct.
2. Remove the blower cover.
3. Remove the blower wheel as follows:
   a. Secure the wheel with a sling strap and overhead crane.
   b. Remove the wheel retaining cap and lock from the end of the shaft (if so equipped).
   c. Remove 2 setscrews from the blower wheel hub.
   d. Carefully pull the blower wheel off the shaft with a puller.
4. Remove the blower housing.
5. Inpect the parts that will be reused.
   a. Inspect blower wheel for damage or wear.
   b. Inspect the shaft, bearings, sheaves and belts.
   c. Replace any damaged or worn parts.
6. Install the new blower housing as follows:
   a. Lift the blower housing into position and align holes in mounting straps and bearing base.
   b. Check to see that the housing is flush and square with the bearing hose.
   c. Check to see that the shaft is centered in the housing hole.
   d. Ream the mounting holes slightly if required to insert capscrews.
   e. Tighten the capscrews securely.
7. Install blower wheel as follows:
   a. Lubricate the shaft with WD-40 or equal.
   b. Install the key in the shaft keyway.
   c. Slide the blower wheel onto the shaft so that the hub is flush with the end of the shaft.
   d. Rotate the blower by hand to ensure the clearance between the housing and wheel.
   e. Place a straight edge over the front of blower and rotate again. There should be no less than 1/8" clearance between the straight edge and wheel.
   f. Install the retainer cap, tighten the capscrews securely and bend the lock tabs over the capscrews.
   g. Tighten the two (2) setscrews in the hub securely.
8. Install the blower cover as follows:
   a. Lift cover into position and bolt securely to the housing.
   b. Slowly and carefully lower the body to check the duct alignment with the cover duct.
   c. With the transformation duct gasket NOT installed, check to see that the ducts are in line left to right, up and down, parallel and spaced 3/8" apart.

NOTE

A 3/8" PLATE PLACED BETWEEN THE DUCTS HELPS DETERMINE THE 3/8" SPACE AND PARALLELISM REQUIRED.

   d. Shim the blower and engine mounting frame to attain alignment.
   e. Install the transformation duct gasket and rivets.
   f. Reinstall the silencer or discharge duct.
9. Start up instructions:
   a. Perform all required maintenance as shown in the operators and service manuals.
   b. Check to see that all capscrews have been securely retightened.
   c. If welding was required, recheck welds.
   d. Start unit as outlined in the operators manual and inspect the balance condition.



BUSHINGS AND SHEAVES INSTALLATION & REMOVAL

REMOVAL

1. Loosen and remove all mounting capscrews.
2. Insert capscrews in all threaded jackscrew holes.
3. Start with the screw furthest from the bushing saw slot and tighten all jackscrews alternately and progressively. Keep turning the screws in small equal amounts until the tapered surfaces disengage.

   Excessive or unequal pressure on the jackscrews can break the bushing flange, making removal very difficult.

INSTALLATION

1. Make sure the tapered-cone surface of the bushing and the mating bore of the sheave are free of all foreign substances, such as dirt, excess paint, accumulations, metal chips, lubricants, etc.
2. Line up the unthreaded holes (C) with the threaded holes (T) and insert capscrews with lock washers engaging only 2 or 3 threads. Screw heads should be mounted outside to enable disassembly.
3. With the key in the shaft key way, slide the loosely-assembled unit onto the shaft and position for belt alignment.

   NOTE

   Use no lubricants or anti-seize compounds on threads or tapered surfaces.

4. Carefully tighten the capscrews alternately and progressively until tapers are sealed (at approximately half the recommended torque).
5. Check alignment and sheave stability and correct as necessary.
6. Continue carefully by alternating and progressively tightening the capscrews to the recommended torque values.

   NOTE

   When properly mounted, there will be a gap between the bushing flange and the sheave after the screws are tightened.

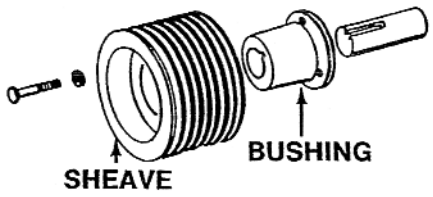
   ⚠CAUTION

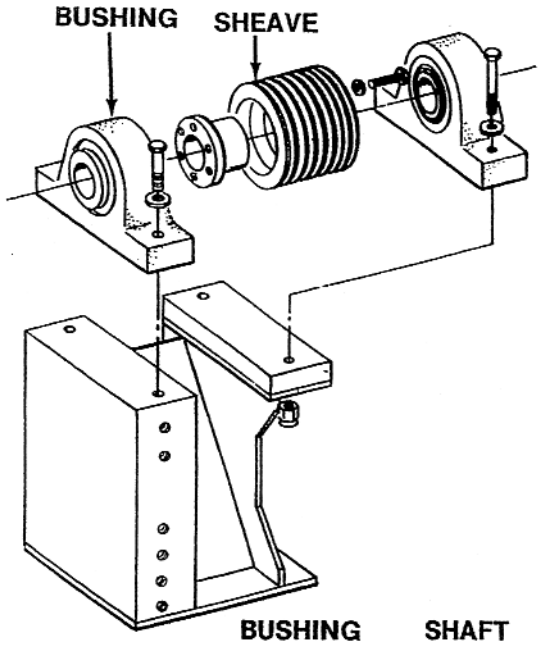
   Use of lubricants and/or excessive screw torque can cause breakage.

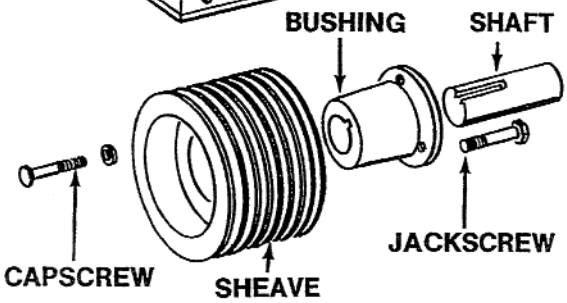
7. Tighten the setscrew to hold the key securely.

RECOMMENDED
Wrench Torque Values
To Use in Tightening Bushings

Bushing Size	Capscrew Size & Thread	Foot Pounds Wrench Torque Normal Applications*
E	1/2-20	40



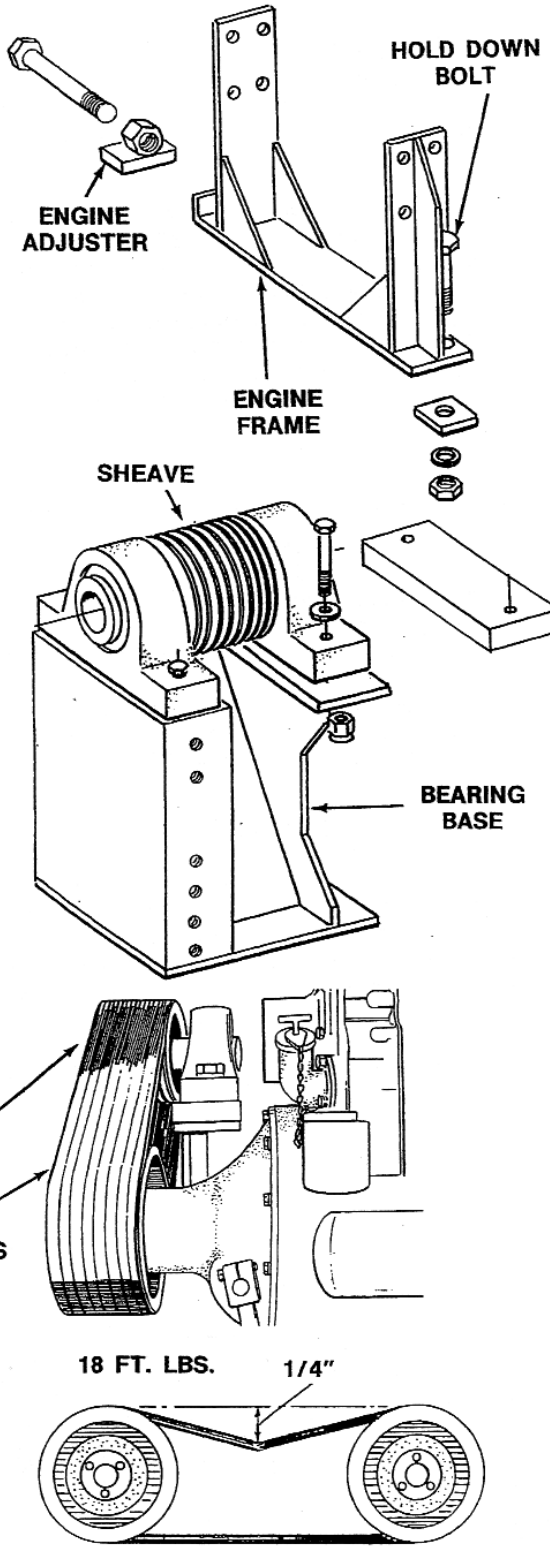




Clean Earth VAC/ALL

PROCEDURE FOR REPLACING BLOWER BEARINGS

1. Raise the Vac/All body and block securely.
2. Drain the hydraulic tank and disconnect the suction and return hoses.
3. Loosen the four (4) capscrews that hold the engine to the engine frame.
4. Move the engine toward the bearing sub-base. This will loosen the V-belts.
5. Remove the V-belts from the engine sheave.
6. Fasten a lifting device to the eye welded on top of the blower housing or remove the blower inspection cover and install chain hook in cover opening.
7. Remove the capscrews that secure the blower housing.
8. Pull the blower wheel off the shaft.
9. Remove the four (4) capscrews that secure the blower bearings to the sub base.
10. Lift the blower bearings, blower sheave, and shaft out as an assembly and put them on the floor or work bench.
11. Clean the bearing shaft completely. Remove any dirt, paint, or grease. The shaft should be bright and shiny after cleaning.
12. Mark the position of the end bearing on the shaft.
13. Loosen the setscrews that hold the bearing and remove the bearing from the shaft.
14. Mark the position of the sheave on the shaft.
15. Remove the sheave.
16. Mark the position of the outer bearing on the shaft.
17. Loosen the setscrew in the bearing and remove from the shaft.
18. Completely re-clean the shaft, removing any burrs or marks from the setscrew.
19. To re-assemble, reverse the above procedure.
20. After installation of the bearings, check the blower wheel for wear and vibration.



PUMP PRESSURE CHECK

Hoists that have a separate control valve have a built-in relief that is factory adjusted to 2,500 psi. If it is necessary to check the relief pressure, it may be done as follows:

Disconnect the valve end of hose leading from the control valve to the LOWER END of the hoist cylinder and cap to the hose. Plug the valve port and install a 0-3000 psi pressure gauge in the pressure line from the pump to the control valve. Then, with the control in the raise position and the engine running at about 1500 rpm, the pressure gauge should indicate approximately 2500 psi.

⚠CAUTION

DO NOT RUN THE PUMP AGAINST THE RELIEF VALVE FOR MORE THAN A FEW SECONDS AT A TIME.

Adjust the relief if necessary, turn the adjusting screw in to increase pressure and out to decrease pressure. DO NOT ADJUST HIGHER THAN 2500 PSI! Reconnect the hose and fittings.

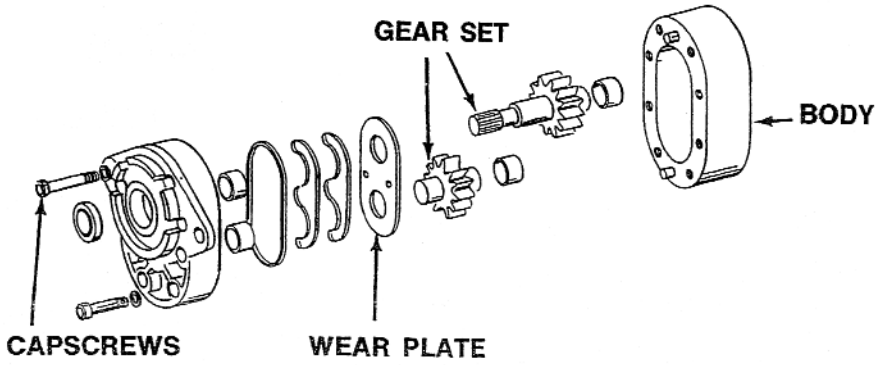
SERVICE INSTRUCTIONS FOR THE HYDRAULIC PUMP

1. Plug the ports and wash the exterior with solvent. Clean the parts and work area.
2. Caution must be used when using a vise to avoid distorting any parts.
3. Never pry components apart. Light tapping with a plastic hammer on drive shaft will separate the body from the cover without burring.

⚠CAUTION

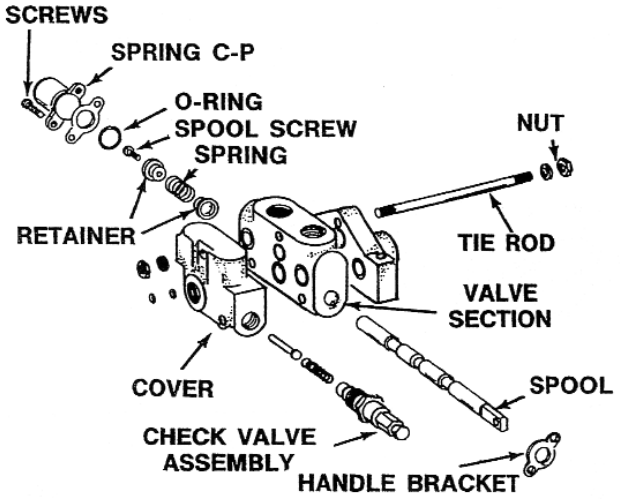
Place a hand over the cover assembly while tapping the drive shaft to prevent dropping parts or disengaging gear mesh.

4. All parts must be free from burrs, scores or nicks.
5. Before removing the gear set, apply marking dye to mating teeth to retain “timing” when reassembling.
6. Use the complete rebuilt Repair Kit with each unit.
7. Extreme care must be used when replacing a shaft seal. It must be installed square with the seal bore and with the metal case to the outside of the pump/motor. Care must be taken to prevent the drive shaft keyway or spline from cutting the new seal. Use a “bullet” type sleeve or tape over the keyway and generously grease the lips of the seal before installing the shaft.
8. Stone gears. Replace as a set if necessary. Lubricate the inside of the cover and insert the gear set, maintaining the original timing and locations.
9. Apply grease to the wearplate and slip over the shafts with the bronze side facing the gears.
10. The mating surfaces of the body and cover must be clean, free of dirt, and dry.
11. Assemble the body to cover, making certain that none of the parts become displaced. Insert, and hand tighten all capscrews.
12. Rotate the drive shaft before tightening the capscrews. Torque all capscrews evenly to avoid distortion.
    5/16 - 18 NC Torque 190 - 210 in lbs.
    3/8 - 16 NC Torque 360 - 380 in lbs.
13. Generously lubricate the pump/motor — break in slowly.



DISASSEMBLY OF HOIST VALVE

1. Scribe a mark across the back of the valve sections. The mark is to be aligned with one of the studs.
2. Remove the nuts and washers from one end of the three studs. Remove the studs.
3. Take the inlet cover, sections and right-hand end cover apart.
4. Remove the check valve assembly from each section.
5. Disassemble the check valve assemblies. Each check valve assembly includes a plug, o-ring, spring and poppet.



ASSEMBLY OF HOIST VALVE

1. Lubricate the new o-rings for the check valves with petroleum jelly. Install the new o-rings on the check valve plugs. Assemble the spring and poppet in each check valve plug.
2. Hold one valve section with check valve bore down. Push the check valve assembly into the valve section. The hole in the side of the check valve assembly must be aligned with the holes in the valve section for the studs. Repeat this step for the other valve sections.
3. Lubricate the new o-rings for the valve sections with petroleum jelly. Install the new o-rings in the grooves of the right-hand end cover and sections.

NOTE

The center o-ring is larger than the other o-rings.

4. Put the nuts on one end of each stud. The nuts should be even with the end of the studs. Install a lockwasher on each stud.
5. Install the studs in the right-hand end cover. Put the right-hand end cover on a flat surface.
6. Install the sections and left-hand inlet cover over the studs as shown. Make sure the marks on each valve section are aligned. Finger tighten the tierod nuts.

REPLACING SPOOL SEALS IN HOIST VALVE

1. Remove lever assembly. Remove the two screws from the spring cap. Remove the spring cap.
2. Remove the spool screw.
3. Carefully store the spring, two spring retainers, small washer and spool screw.
4. Remove the two screws from the handle bracket. Remove the handle bracket.
5. Remove the wiper seal. Do not move the spool from the neutral position.
6. Carefully rotate the spool and pull towards the handle end until you see the o-ring in the valve body at the cap end. Remove and discard the o-ring. Use a small tool with a sharp point.
7. Carefully rotate the spool and push towards the cap end until you see the o-ring in the valve body. Remove and discard the o-ring and replace with a new o-ring. Repeat STEP 6 to fit new o-ring in the valve body at the cap end.
8. Install a new wiper seal over the spool. The lips of wiper seal must be turned away from the body.
9. Install the handle bracket with two screws.
10. Install one spring retainer as shown. Add the small washer.
11. Install the spring, spring retainer and spool screw.
12. Apply Loctite 242 to the threads of the spool screw. Install the spool screw and tighten.

NOTE

Make sure the shoulder on the spool screw goes through the small washer and lower spring retainer.

13. Install the spring cap and two screws. Install lever assembly.

SERVICING HOIST RELIEF VALVE

NOTE

This service can be done with the control valve installed in the machine.

CHECK VALVES

1. Inspect the poppet for damage or wear.
2. Inspect the spring for damage.
3. Remove and discard the o-ring from the check valve plug. Do not reuse the old o-ring.

SERVICE RELIEF VALVES

1. Remove the cap from the relief valve cartlidge.
2. Remove the poppet, spring and shims from the relief valve body.
3. Remove the relief valve cartridge from the control valve.
4. Clean and inspect all parts for damage for wear. If any part is damaged, the complete relief valve assembly must be replaced. Do not use part of one relief valve on another relief valve.
5. Remove the o-ring from the relief valve body and cap. Lubricate new o-rings with petroleum jelly. Install the new o-rings.
6. Assemble the poppet, shims, spring and cap on the relief valve. Tighten cap to 10 ft. lb. maximum torque.

DIRECTIONS FOR USING INTAKE HOSE REPAIR KIT

Inspect the hose frequently. As soon as cracks, punctures or other leaks are detected, use the following procedure to repair them.

REPAIRING HOSE

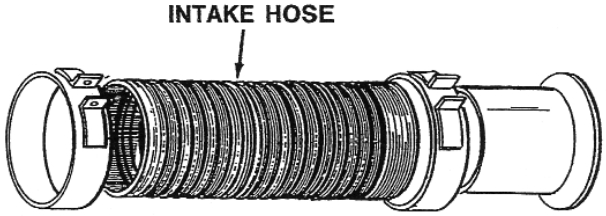
1. Sand the surface lightly and then wipe with a good quality thinner or rubber cleaner, (either one used should be the “evaporating type”).
2. Stir the liquid neoprene coating well, then brush on. Use a wet brush at all times, avoid a scrubbing action.
3. Apply approximately 10 coats to build up a thickness of 1/32”.
4. Allow about one-half hour drying time between coats.
5. Dust with talcum powder.

REPAIRING CRACKS AND PUNCTURES

1. Clean the surface with thinner or cleaner, (same type as above). Let the surface dry.
2. Apply liquid neoprene coating to the damaged area — one convolution on each side of the break. Let dry until tacky.
3. Apply 1/32” x 3” wide friction rayon fabric over the coated area. Use stitcher.
4. a. Apply another coat of liquid neoprene.
   b. Then apply two (2) more coats at one-half hour intervals to ensure good adhesion.
5. Dust with talcum powder.

To reorder repair kit material, please specify the following part numbers:

Part No. E-446-1 Black Neoprene Coating (1 Qt.)
Part No. E446-3 1/32” x 3” x 12” Lg. Friction Rayon Fabric



WATER SYSTEM

The water pump furnished with the Jetting Attachment is a centrifugal type pump. When operated at governed engine speed, it will deliver water to the nozzle at approximately 90 psi. This centrifugal pump will pass small particles of sand or foreign matter without damage to the pump.

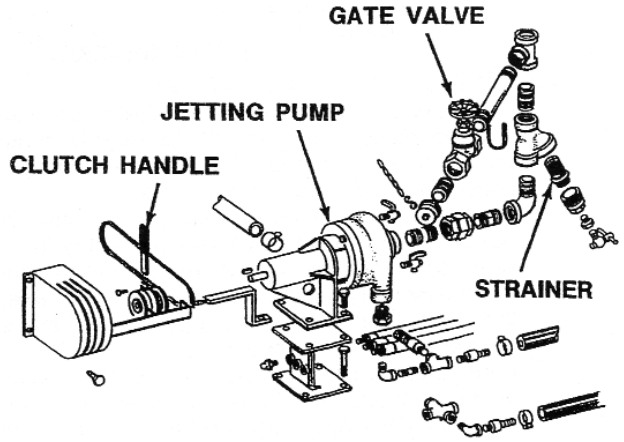
⚠CAUTION

DO NOT RUN DRY.

Before initial operation it is absolutely necessary that both the casing and the suction piping be completely filled with water. This priming is accomplished by opening the pump vent cock on top of the impeller housing and allowing the casing and suction piping to fill by gravity. The pump is primed when water flows freely from the vent cock. The water tank should always contain enough water to keep both the casing and the suction piping completely filled. If the tank is accidently run dry, immediately declutch the pump or stop the blower engine. Before restarting the pump, the system must be primed again.

⚠CAUTION

IF THESE INSTRUCTIONS ARE NOT FOLLOWED, PERMANENT DAMAGE TO THE PUMP WILL OCCUR!



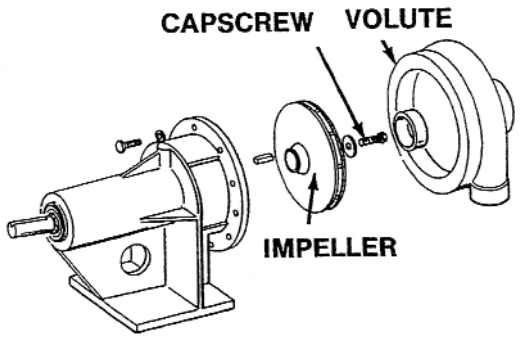
A discharge gate valve is supplied with the piping system to stop the flow of water from the pump when the jetting hose is disconnected. When the pump is being operated, however, this valve should be kept open and the nozzle valve used to start, stop, adjust or throttle the amount of water discharged through the nozzle.

NOTE

STRAINER ELEMENT SHOULD BE REMOVED AND CLEANED WEEKLY.

TO DISASSEMBLE PUMP

1. Disconnect piping then remove volute.
2. Remove the impeller capscrew or nut.
3. Remove impeller by using wheel puller, apply heat if necessary, to prevent breaking or damaging of the impeller.
4. Remove the packing insert.
5. Remove the packing follower and rings from the packing insert.
6. Remove the sleeve by applying heat to loosen the Loctite.

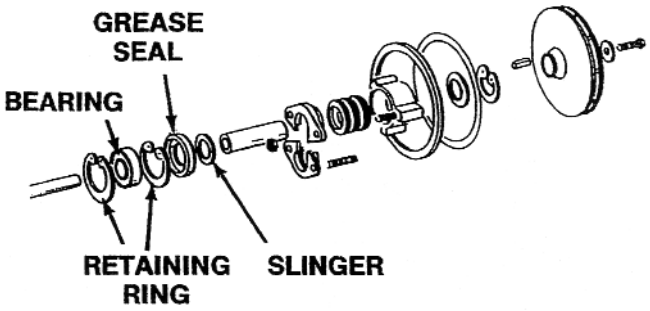


7. Remove slinger.
8. Remove grease seal(s).
9. Remove bearing housing retaining ring.
10. Press or tap bearing shaft assembly until one bearing is out.
11. When one bearing is out, remove second retaining ring, then remove complete assembly from bearing housing.
12. Remove shaft retaining ring and press off bearings.

NOTE

Loctite is a liquid sealant which when isolated between metal surfaces becomes a tough seal. Loctite is used on some impellers and all shaft sleeves.

1. To remove parts assembled with Loctite:
   a. Heat part with a torch and then remove while the part is still warm.



NOTE

Wear rings minimize leakage from high pressure zones to low pressure zones inside the pump. Wear rings should be replaced when the diametrical clearance between the impeller and the wear rings exceeds the following valves:

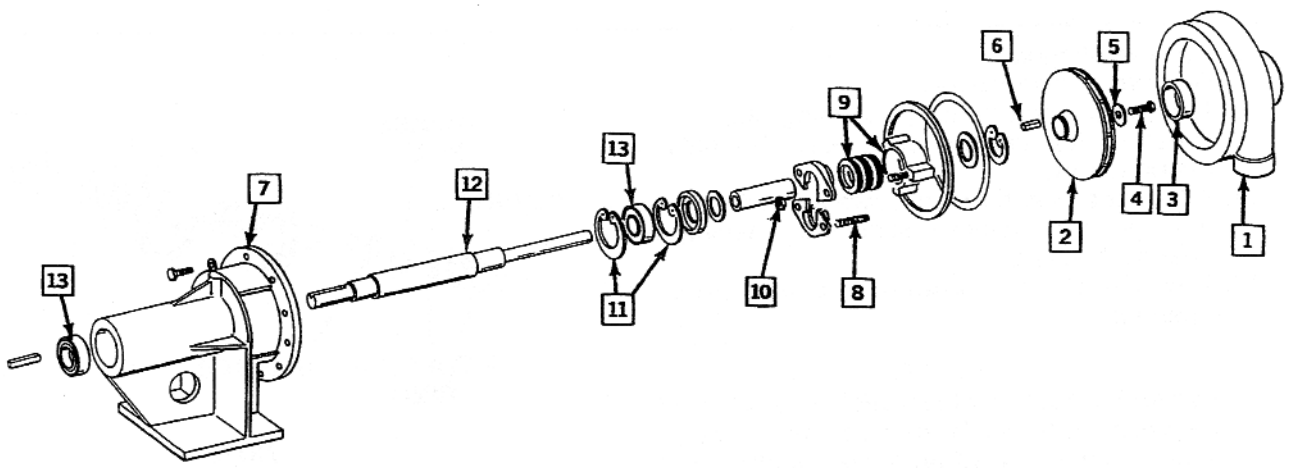
PUMP DISCHARGE	MAXIMUM CLEARANCE
1' —	.030"

1. To remove old rings, drill two holes slightly smaller than the width of the ring on the periphery. Then using a chisel, break the ring in two.
2. Press in new ring, making sure to press it in squarely. On larger rings, it is more practical to tap the ring in place.

TO REASSEMBLE PUMP

1. Install a new sleeve using Loctite, and noting the proper position of its key notch.
2. Repack insert.
3. Install packing insert, making sure that the shaft does not strike the ceramic seat during installation.
4. Install new wear rings.
5. Install the packing.
6. Install impeller, first making sure the shaft is clean and coated with white lead.
7. Install the volute and the piping.

1. Volute
2. Impeller
3. Wear Ring Volute
4. Impeller Capscrew
5. Impeller Washer
6. Impeller Key
7. Housing
8. Stud Gland
9. Packing Insert
10. Nut Packing
11. Retaining Ring
12. Shaft
13. Bearings



NOTE

When assembling an impeller or sleeve, make sure it goes all the way to the shaft shoulder.

To reassemble bearing frame:

1. Press on new bearings. Remember to support inner races of bearings while pressing them on.
2. Assemble frame in the reverse procedure used for disassembly.

PACKING

1. Tighten the packing gland only when the pump is running. The packing gland should be just tight enough so that only 3 to 6 drops per minute appear when the pump is running

⚠CAUTION

DO NOT OVER TIGHTEN

A few drops of water per minute dripping are necessary to prevent scoring and lubricate the shaft. NEVER tighten packing gland so tight that there is no leakage.

2. When the gland has been fully drawn up against the pump, loosen and add packing. After adding packing once or twice, remove and repack the pump. Insert the lead ring of packing and push it home firmly and evenly. Insert the rings of graphite packing one at a time, staggering the joints, and push them home firmly and evenly. When the packing box is full, place a split packing gland in place. With the pump running, tighten the packing gland just enough so dripping is reduced to a few drops a minute. DO NOT TIGHTEN so much that dripping is completely stopped or the sleeve will score.

NOTE

Metallic packing is not recommended.

To reassemble with Loctite:

a. Wipe parts clean.
b. Rinse with greaseless chlorinated cleaner (Loctite or carbon tetrachloride).
c. Wet clean surfaces with Loctite.
d. Assemble parts, twisting when possible to evenly distribute Loctite. Allow a few hours for hardening.

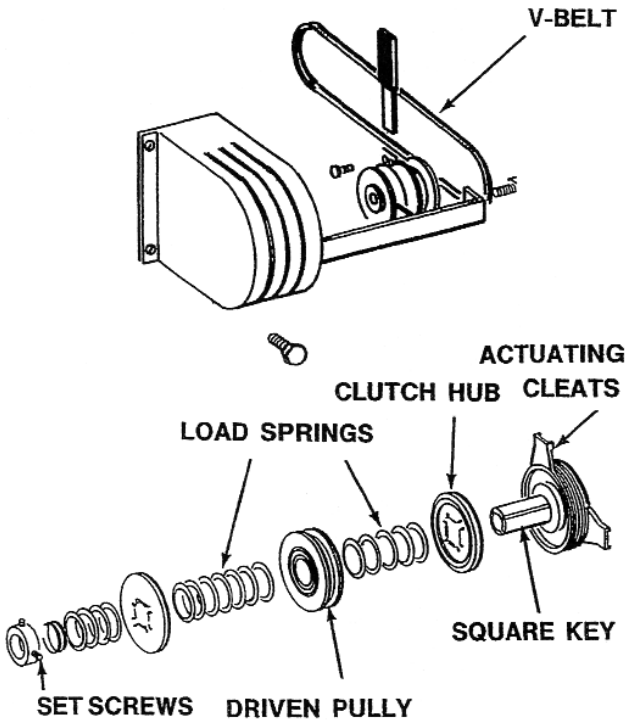
WATER PUMP CLUTCH INSTALLATION

When installing or removing the clutch, apply pressure to the CLUTCH HUB only. Do not pound or pry under any circumstances.

The clutch pulley and the driven pulley must be closely aligned along the V-Belt axis, to assure a perfectly straight belt drive. A misaligned belt can cause the clutch to drag and hence wear when disengaged, or can cause premature wear on the pulley bearing and V-Belt.

The clutch hub is driven from the shaft through a square key. The clutch is located on and secured to the shaft by two (2) setscrews. Recommended torque on these screws is 65 lb./in.

When installing clutch, the actuating cleat, which is anchored, must be free to float on its restraint, both axially and radially. This will prevent eccentric loads from being imposed on the cam bearings. Since the cams move apart during actuation, BOTH cleats must float axially to avoid binding or cocking.



MAINTENANCE

Load springs automatically adjust the clutch to compensate for wear of the friction lining on the pressure plate assemblies, once the proper clearance is established.

A TOTAL CLEARANCE OF .020" TO .030" SHOULD BE MAINTAINED BETWEEN THE FRICTION LINING AND THE PULLEY WHEN THE CLUTCH IS DISENGAGED.

Ball bearings are grease-packed for life and sealed to prevent entry of contaminants. No maintenance is required.

The area between the cams and bearings is protected from contamination by flexible cam cover. However, since the cam bearings must slide on the hub, excessive contamination must be avoided to prevent build-up, which would keep the bearings from moving freely.

WATER PUMP BELT REPLACEMENT AND ADJUSTMENT

To replace the water pump drive belt:

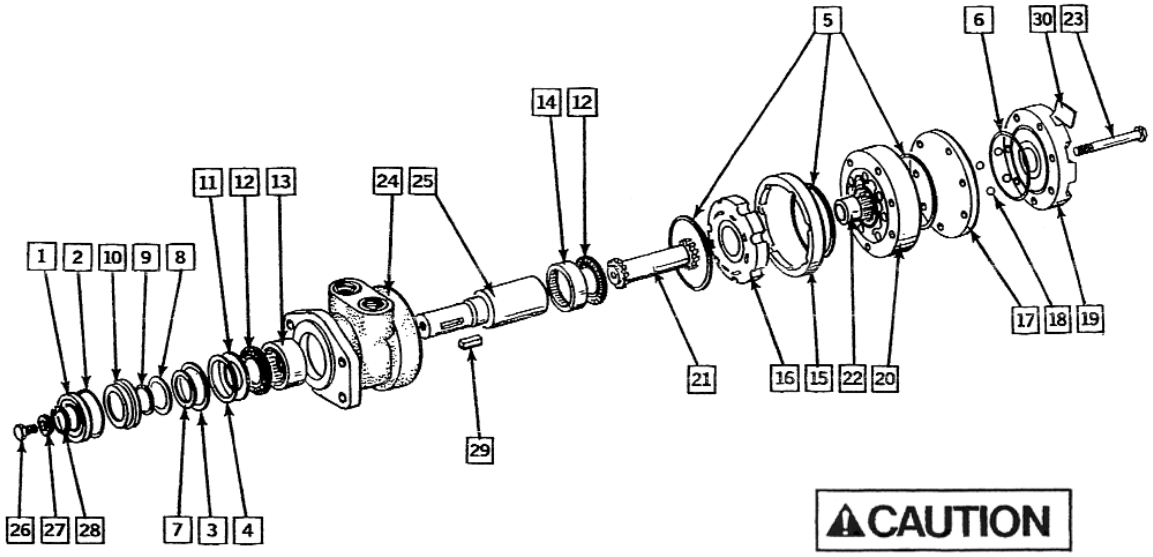
1. Remove the bolts that secure the belt and clutch guard to the engine frame.
2. Remove guard slipping it over the clutch handle.
3. Loosen the 4 bolts that secure the water pump to its mounting base and move the pump rearward towards the engine.
4. Remove the belt from the clutch sheave and at the engine drives sheave.
5. Install new belt in reverse order of removal.

BELT TENSION (NEW BELT)

Proper belt tension is obtained when the belt is depressed in the center with 10 lbs. of force to deflect 5/16". This is the initial tension of the belt. After 24 to 48 hours of operation, the belt should be retensioned to compensate for stretch in the belt. Again depress the center of the belt but now only use 6 ft. lbs. of force to deflect the belt 5/16".

NOTE

A belt tension gauge 9877-0005 is available from Vac/All.



⚠CAUTION

Prior to disassembly, clean off the exterior of the motor. Remove the key and snap ring from the shaft. It may be helpful for later reference to use a felt marker to note the "Top" and "Bottom" of each component with respect to the piece next to it, as proper reassembly is critical in this regard. There is no internal timing required and radial location is unimportant.

SERVICE INSTRUCTIONS FOR THE HYDRAULIC GUTTER/TRANSFER BROOM MOTOR

DISASSEMBLY OF MOTOR

1. Place motor in vice with shaft end down, clamping around the motor ports.
2. Remove the end cover bolts (item 23) and remove end cover (item 19).
3. Remove the balance plate (item 17), taking care not to loose the (4) 3/16" balls located in the four holes in the balance plate.
4. Remove the rotor assembly (item 20), the manifold boot (item 15), the manifold (item 16), the drive link (item 21), the spacer (item 22), and the thrust bearing (item 12).
5. Remove the shaft (item 25) from the motor housing.
6. Turn the housing over and pry out the dust seal (item 1).
7. Push the seal carrier (item 10), the thrust washer (item 11) and the thrust bearing (item 12) down toward the roller bearing located in the housing bore. Next, remove the snap ring (item 2), the steel back-up shim (item 3) and the lathe cut seal (item 4) from the inner bore groove of the housing with a small screwdriver.
8. Lift out the seal carrier, thrust washer, and thrust bearing from the housing bore. Note that the metal portion of the seal carrier and the thrust washer are not provided in the seal kit and must be revised.

1. Seal, Dust
2. Ring, Snap Wire
3. Shim, Backup
4. Seal, Lathe Cut
5. Seal, Body
6. Seal, Body
7. Seal, Shaft
8. Seal, Backup
9. Shim, Backup
10. Seal Carrier
11. Thrust Washer
12. Thrust Bearing (2 Required)
13. Roller Bearing (Front)
14. Roller Bearing (Rear)
15. Manifold Boot
16. Manifold Plate
17. Balance Plate
18. 3/16" Steel Ball (4 Required)
19. End Cover
20. Rotor Assembly
21. Drivelink
22. Drivelink Spacer
23. Bolts (7 Required)
24. Housing
25. Shaft
26. Bolt
27. Washer
28. Snap Ring
29. Key
30. I.D. Tag

INSTALLATION OF SEAL KIT

1. Place the housing in a vise with the mounting flange up.
2. Place thrust bearing on shaft.
3. Place thrust washer on shaft.
4. Place the protective shaft seal installation sleeve with the shaft seal still on it over the shaft end. (Apply oil to the backup shim and shaft seal prior to installation.)
5. Install the shaft seal over the sleeve and onto the the shaft down to the thrust washer.
6. Remove the installation sleeve and discard.
7. Install the teflon back-up shim onto the shaft. The lip on the Teflon back-up shim should engage with the shaft seal.
8. Install back-up ring onto shaft and down against the Teflon back-up shim.
9. Place the seal carrier onto the shaft.

NOTE

It is recommended that a seal carrier installation guide be used to push the seal carrier straight down over the shaft seal assembly. Care must be taken not to cock the carrier while installing or damage to the seal will occur. If a seal carrier installation guide is not available, you may use your fingers or short piece of pipe to carefully and gently push the seal carrier over the seal. (Contact your local Vac/All Distributor for a carrier guide assembly).

REASSEMBLY OF MOTOR

1. Slide the shaft assembly into the housing so that the seal carrier is beyond the in bore of the seal groove.
2. Install the lathe cut seal into the inner bore groove.
3. Install the steel back-up shim next to the seal.

NOTE

The shim must be folded and bent slightly and worked into place with a small screwdriver.

4. Install the wire retaining ring next to the steel back-up shim.
5. Reposition the housing in the vise so the shaft is facing down.
6. Install drive link noting direction in which it was removed. Tap lightly on the drive link end to seat the shaft assembly into the retaining ring.
7. Place the thrust bearing on the shaft end. Make sure the bearing sits inside the housing bore.
8. Install the body seal into the groove of the housing.
9. Place the manifold onto the housing aligning the bolt holes.

NOTE

Manifold side with only (7) valving holes goes towards the housing.

10. Place the manifold boot around the manifold.
11. Install one body seal into the groove in “bottom” side of rotor assembly. Bottom side of rotor has one deep groove. Place rotor assembly on the manifold engaging the drive link spines. Now turn the rotor assembly to align the bolt holes.
12. Place space on the drive link end.

NOTE

Motors built prior to January 1986 have a pin in lieu of a spacer. This spin must engage in the center hole of the balance plate.

13. Place the balance plate onto the rotor assembly and install (4) 3/16” check balls into the holes provided.
14. Install the body seal into the seal groove of the end cover.
15. Place the end cover onto the balance plate and align bolt holes.
16. Insert seven bolts into the end cover and torque in a crisscross manner to 50 ft. lbs.
17. Remove the motor from the vise and place on a work bench with the shaft up.
18. Install the dust seal so it is flush with the pilot face of the housing.

BODY LOAD LIMIT INDICATOR

PRINCIPLE OF OPERATION:

When the Vac/All body fills up to a capacity load, the rear axle switch closes, making the circuit to the time delay relay and solenoid thereby energizing the light and buzzer. The time delay relay functions to minimize false alarms when the truck goes over bumps. A defeat switch in the cab allows the driver to shut off the buzzer until the load is dumped. The overload warning light remains “on” until the overload is removed. The test/operating light is “on” when the truck ignition switch is “on” and goes “off” when an overload condition prevails. The system is under “test” continuously until an overload condition occurs, at which time the “overload” warning light illuminates.

INSTRUCTIONS FOR SETTING SINGLE AXLE LOAD SWITCH 10-13 YD.

1. During the course of this procedure, observe the load switch lever arm movement. The load switch mounting bracket may have to be adjusted to meet load requirements.
2. With the Vac/All body and water storage tank empty, run the truck over a scale to determine the front and rear axle weights. The lever arm on the load switch, item 11, will be at its lowest position at this time.
3. Now some calculations are necessary to arrive at a load setting that meets one or more of the following requirements.
   a. State load regulation.
   b. Axle and/or tire rating.
   c. Customer specification.

   Subtract the rear axle weight from one of the above maximum conditions. To provide a payload for setting the load switches, partially fill the Vac/All body with water to prescribed depth, which may be observed through an open port hold. Divide the weight difference of a 13 yard Vac/All body by 332 pounds/inch of depth. This figure is the depth of water that will produce the desired payload.

   Example: 22,000# Maximum load requirement
   15,000# Rear Axle weight with water tank & body empty.
   6,500# Difference in weight
   - 332# = 20” depth of water in body from floor

4. Loosen capscrews on the switch mounting bracket and adjust until the buzzer sounds in the cab. Make certain that the switch lever arm is positioned so it can override the centerline of the bellhousing.

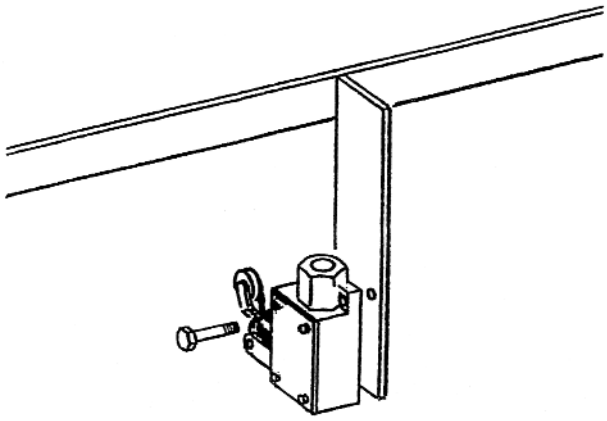
INSTRUCTIONS FOR SETTING SINGLE AXLE LOAD SWITCH 14-16 YD.

1. During the course of this procedure, observe the load to switch lever arm movement. The load switch mounting bracket may have to be adjusted to meet load requirements.
2. With the Vac/All body and water storage tank empty, run the truck over a scale to determine the front and rear axle weights. The lever arm on the load switch, item 11, will be at its lowest position at this time.
3. Now some calculations are necessary to arrive at a load setting that meets one or more of the following requirements.

   Subtract the rear axle weight from one of the above maximum conditions. To provide a payload for setting the load switches, partially fill the Vac/All body with water to prescribed depth, which may be observed through an open port hold. Divide the weight difference of a 16 yard Vac/All body by 463 pounds/inch of depth. This figure is the depth of water that will produce the desired payload.

   Example: 32,000# Maximum load requirement
   21,000# Rear Axle weight with water tank & body empty.
   11,000# Difference in weight
   - 463# = 24” depth of water in body from floor

4. Loosen capscrews on the switch mounting bracket and adjust until the buzzer sounds in the cab. Make certain that the switch lever arm is positioned so it can override the centerline of the bellhousing.



SECTION 6 ELECTRICAL

DESCRIPTION OF ELECTRICAL SYSTEM

The E5/E10 electrical system includes all of the unit's running and marker lights, power boom, engine controller, sweeper controls, hydraulic panel, and all interconnected wiring as shown on the accompanying diagrams.

TESTING

To locate a defective component or break in the wiring, perform a continuity check across and between suspected components as described in Section 1, GENERAL REPAIR PRACTICES.

REPAIR

Repair of the electrical system is limited to replacement of defective parts or wiring.

INSPECTION

1. Operate all switches and pushbutton controls to ensure that they are operating normally.
2. Check all wiring for breaks, frayed or worn insullation, and loose terminal connections.

⚠CAUTION

Refer to the specific electrical schematic for the described function. Many combinations are possible, only those commonly used are presented. It may be necessary to refer to more than one (1) schematic.

VAC/ALL SERVICE MANUALS AND LITERATURE ORDER FORM

No.	Title	List Price	Quantity	Extended
	Current Production Units	(each)		
105607	E5/E10 Operators 3600	N/C	_____	
105608	E5/E10 Parts 3600	N/C	_____	
105609	E5/E10 Service 3600	N/C	_____	
105610	VSS812 Operators 3600	N/C	_____	
105611	VSS812 Parts 3600	N/C	_____	
105612	VSS812 Service 3600	N/C	_____	
	Previous Production Units			
105389	E5/E10 Operators	N/C	_____	
102528	E5/E10 Parts	N/C	_____	
105540	E5/E10 Service	N/C	_____	
105411	VSS812 Operators	N/C	_____	
105413	VSS812 Parts	N/C	_____	
105412	VSS812 Service	N/C	_____	
105391	E-4010 Operators	N/C	_____	
102482	E-4310 Operators	N/C	_____	
102478	L-400B Leaf Loader Op/Parts/Service	N/C	_____	
102428	S-330 Selecto Spreader Op/Parts/Service	N/C	_____	
	Safety Items			
105532	Safety Booklets	N/C	_____	
101372	Safety Vest	$10.55	_____	_____
	Other Materials			
102433	VacAll three-ring binder	$7.00	_____	_____
102480	Blotter Paper (20 sheets) (for testing hydraulic fluid)	$3.20	_____	_____
			Total Enclosed	_____

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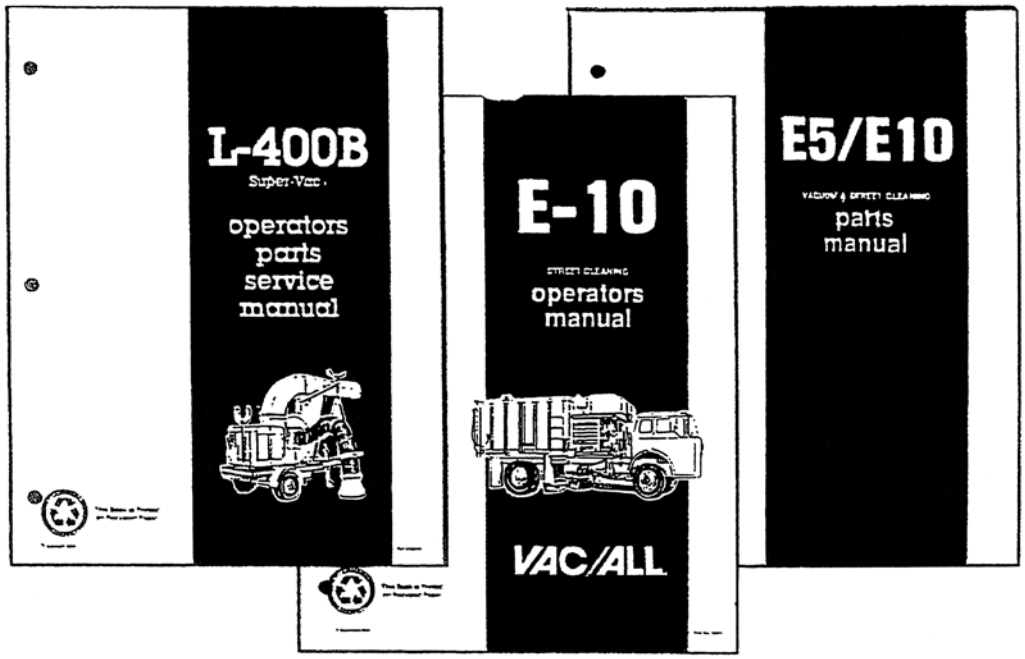

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